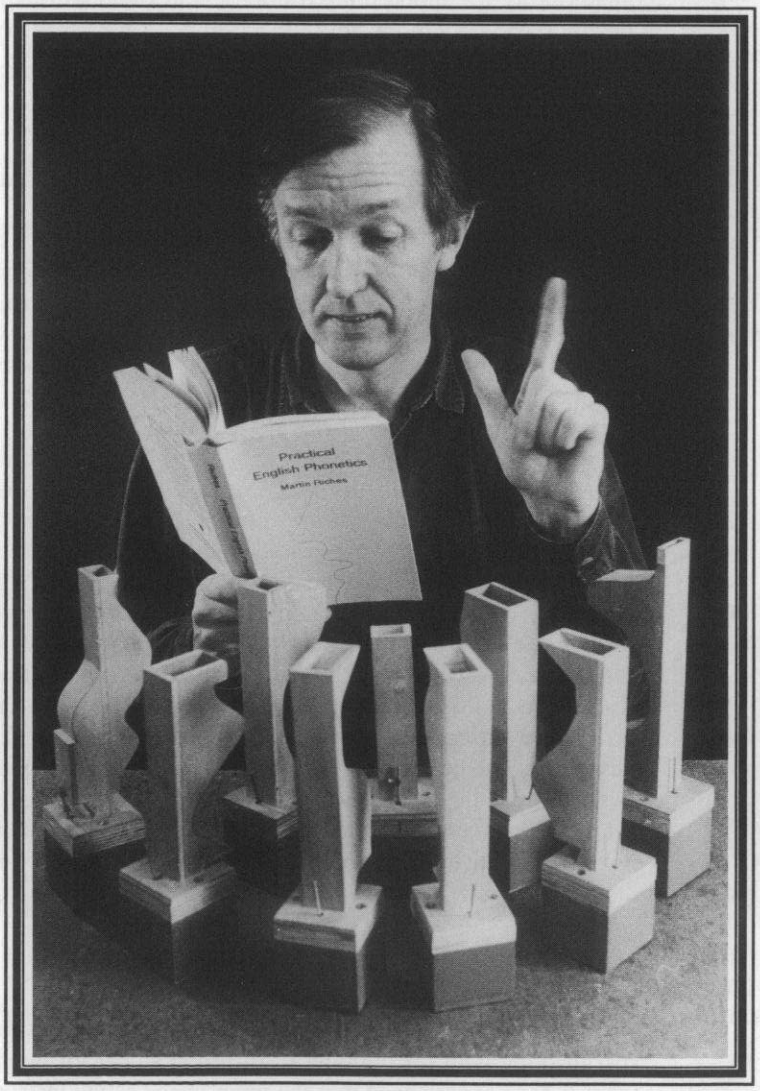
VOLUME 13 #2 DECEMBER 1997 PRICE $6

EXPERIMENTAL MUSICAL INSTRUMENTS

For the Design, Construction, and Enjoyment of Unusual Sound Sources



Above: Martin Riches with resonator pipes for the Talking Machine. See his artilce starting on page 11.

BALLOONS & BUG BOXES

In the photograph on this page, the Professor teaches his students the art of speech. The professor is Martin Riches, maker of sound instruments and automata. And the students, gathered round in rapt attention, are the resonator pipes for one of Martin's major projects, an acoustic talking machine. Each pipe produces one of the vowel sounds of human speech by mimicking the shape of the vocal tract for that vowel. By sounding the pipes in the proper sequences, with aid of additional devices and techniques to recreate the consonants ...

... But, of course, there's more to it than that. Turn to Martin's article in this issue of *Experimental Musical Instruments* for the full story on the Talking Machine.

Also in this issue of *Experimental Musical Instruments* you will find Richard Arias' report on techniques for balloon music. Reed Ghazala answers the question "What on earth is a Solar Bug Box?" Scot Jenerik scares the editor with his descriptions of fire-sound performance. Other articles in this issue look at recent attempts at reconstruction of Greek music and instruments, the basics of the styrofoam cello, a patent search for horned violins ... and much more.

So open, and read.

In the Letters section of *EMI*'s last issue, the question arose as to how the classic "ah-ooh-ga" automobile horns produce their sounds. A couple of readers took the time to answer; here are their letters.

AH-OOH-GA HORNS, at least the one I stripped off an old deserted Franklin many years ago, contained an electric motor which directly spun against a "knob" on a metal diaphragm; that is how I remember it. The "shape" of the sound had to do with the motor getting up to speed and then back down. The ones on Fords etc. looked a bit different, which I expect might be explained by a difference in the electrical characteristics of the motor as it got up to speed, or in the degree of friction between the motor shaft and the "knob" on the diaphragm.

– Zeno Okeanos

THE OLD MODEL T HORN contained a dc motor with disk about the size of a quarter on the end of its shaft. The disk was not flat, but wavy, having a series of ridges and valleys extending radially from the center. Above and parallel to the disk was the diaphragm, which had a stud pressed against the disk near its outer edge. When the motor shaft rotated, the diaphragm was forced to move in and out. The cavity above the diaphragm and the horn connected to it were tuned to resonate at the frequency produced when the motor was up to speed, producing the "ooh" sound. The "ah" and "ga" sounds were made as the motor revved up, and as it slowed to a stop, respectively. To pronounce "ah-ooh-ga" correctly one must change the pitch of the voice, rising about an octave during the "ah" and letting it fall similarly during the "ga." A very satisfying horn, with much more character than today's raucous beeps.

— John Coltman

In connection with last issue's article on drums and other instruments made from plumbing fixtures of PVC plastic, Susan Rawcliffe writes:

I HAVE A BONE TO PICK with you, one I've picked before, regarding the use of PVC in musical instrument building. Remember that PVC is short for polyvinylchloride. When you heat it, as when cutting, it releases chlorine gas. This is not good for you or for the environment. Yes, you can wear a mask, but you are still releasing it into the air. Yes, we are all doing much worse when we get in our cars etc. but we have to begin somewhere. In addition, PVC is illegal to use in plumbing to bring drinking water into a house because it is miscible in water. This means that it is slightly soluble in water. Do you really want to put a soluble chlorine material into your mouth filled with acidic saliva designed to break down food? Yes, it's true that you may not have an immediate reaction to PVC; it is also true that one or two times will probably not hurt you. But do you want to make a practice of it? Do you want to even suggest that children do it?

— Susan Rawcliffe

MY WIFE AND I were at Burning Man [an alternative arts event/celebration/ritual which takes place annually at a desert location in the American west] and saw a wooden instrument about the size of a coffin. At one end there was a crank that turned a wheel. The wheel turned under strings. The strings were attached to what looked like a guitar (maybe a stand-up bass?) fretboard and tuning head. The top was barrel-shaped and the bottom appeared flat. One man turned the crank and another fingered the strings. There were sound holes in various locations on the body and microphones in some of them. The mics ran to a mixing board where a third man adjusted the levels.

We ran into all this at night on the desert. We had no camera with us and never got the name of the instrument builder. Have you ever heard of this instrument?

— Doug Foss

From the editor: The instrument described would seem to be a contemporary variation on the historical European hurdy gurdy. If any readers know more about this particular manifestation or its makers, perhaps they can pass along some information.

I JUST WANTED TO TELL about a marvelous instrument-making class I took in Salzburg, Austria, at the Orff Institut. (I was attending the International program for two weeks) The class was for four afternoons and taught by a charming man from Madrid, Spain (spoke only Spanish and German), Leonardo Riveiro. We built in those few hours bamboo panpipes, a guiro, a weird trombone-sounding flute thing out of pvc pipe, and an ocarina-type flute, out of bamboo. Actually, the material wasn't bamboo, it was much lighter and thinner, and he called it "canya" — not sure of the spelling. Apparently it's some kind of common river-grown reed; my nursery man thinks it might be "aruncus" that grows up in the Delta. [It may have been *arundo donax,* the same cane reed used for the ney and other flute forms, as well as reeds for classical reed instruments, and which does indeed grow along some of the rivers here in Northern California. – ed.] Anyway, the shop at the Institut was fully equipped with hand tools and table saws etc.; a dream of a place. Leonardo teaches kids how to build instruments and encourages them to create performance ensembles. We only had time for those simple instruments, but he showed us pictures of drums, xylophones, pipes, bells, etc that he'd worked on with kids. Even though I've built a full Javanese gamelan out of aluminum, I'd never made simple rhythm instruments, so it was a great learning experience.

— Joan Bell Cowan

I WOULD LIKE TO COME IN CONTACT with people who are experimenting with the building of different shapes of the didgeridoo. I have experienced that the inner shape of the instrument has an influence on the sound. For instance an extra room near

the mouthpiece. My special interest goes to the following items:

—finding new possibilities of sound by the shape of the instrument, for instance, the stronger sounding of the overtones.

—effects of inner coatings (hard, soft etc.)

—attaching extra soundrooms, strings or plastic skin, to the instrument.

My email: yanto.van.den.heuvel@tip.nl

— Yanto van den Heuvel

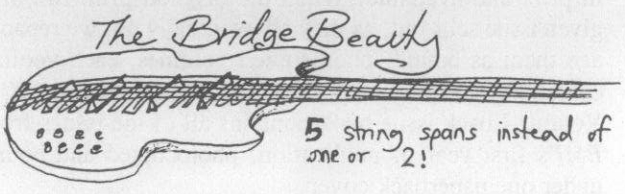
WHILE READING *Musical Instrument Design* [a book on instrument making, available from *EMI*] I was noticing how often styrofoam came up in designs. I have been using Gorilla Glue on musical instruments. This glue is made from polyurethane; what it does when drying/curing is that it turns into foam — lets the soundboards float and bonds to sides at the same time. Regular aliphatic resin glue (Tite Bond I & II) seems to act like a dampener compared to the polyurethane glue. Also Gorilla Glue has excellent directions, seems to work very good in about thirty instruments I've made with one 8 oz. bottle. I tried Tight Bond's polyurethane glue but it's so thick that it seems to start setting right in the container it comes in; you have to break skin in the container (I did twice in one day) while it never happened with the Gorilla in over 2 months.

— Bill Mauzey

The following note is from Jason Gibbs in response to a letter in *EMI*'s June 1997 issue, raising some questions about the instrument known as *Đan bâu* discussed Jason's earlier article "A Musical Instrument Workshop in Hanoi" (*EMI* Vol 12 #1, Sept 1996).

IN RESPONSE to Robin Gill's letter, he is correct that the *Đan bâu* is usually plucked with the left hand, with the right hand pressing and pulling on the lever (my own left-handedness got the best of me in my reversed description). The *Đan bâu*'s string is not attached to the gourd, strictly an ornamental element, but to the lever, which is notched allowing the string to be wrapped around it. The lever is today usually made from water buffalo horn, a material probably not readily available in Europe and America. In the past it was made out of bamboo, but could be made out of any material firm enough to hold the string taut, but flexible enough to allow bending.

— Jason Gibbs



The Bridge Beauty: a multiple-bridge guitar with five string-spans — the latest in a series of drawings of imaginative instruments from Peter Etcetera

IN THIS ISSUE

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SUBMISSIONS: Experimental Musical Instruments welcomes submissions of articles relating to new or unusual musical instruments. A query letter or phone call is suggested before sending articles.

NOTHING LASTS FOREVER

Including Experimental Musical Instruments

EMI WILL CEASE PUBLICATION AFTER SUMMER 1999

A letter from the editor:

After what will have been fourteen years of publishing, *Experimental Musical Instruments* will print its last issue in June of 1999. Following that, although the magazine will no longer appear, *EMI* as an organization will continue on a smaller scale, taking orders for the back issues, tapes, books and other items that we will continue to make available. At the time of this writing, Summer '99 is still almost two years away. It's my hope that with this much lead time and a bit of advance planning the shut-down process will happen smoothly, without leaving promised articles unpublished, subscription terms half-filled, and similar loose ends.

Several factors have led me to make the decision to put *EMI* to bed. Most of the reasons have to do with my own personal directions and are not the result of any difficulties here at *Experimental Musical Instruments*. But one consideration has been especially important: I have a growing intuition that the best that I will have had to offer as *EMI*'s editor has already been realized, and that we're now entering the downward slope of that curve. Accordingly, this seems like a good time to bow out. At the same time, interesting new developments in the world of musical instruments continue to come across my desk every day. It seems like there are more people doing good work in instrument making now than ever. And that, naturally, will continue long after my work with this magazine has ceased.

Pulling *EMI* together over these last many years has been more than a pleasure for me. Working with the many, many people who have contributed their time and creativity to the effort has been one of the great joys of my life. My heartfelt thanks go out to all these people. *Experimental Musical Instruments* is nothing more nor less than the sum of their efforts.

The summer of 1999, meanwhile, is still a long way away, and life around here goes on. Following this issue, there are six more to come. We have a ton of good stuff lined up to go into them. So, please, don't go away yet!

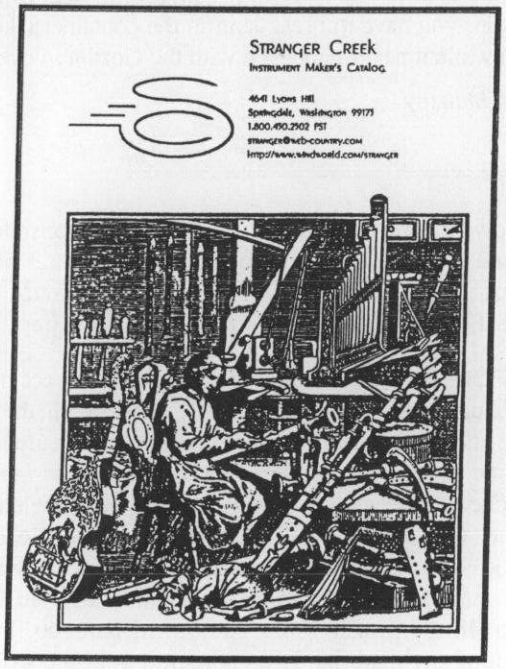
Some business matters relating to these plans: Our renewal notices from now on will reflect *EMI*'s finite remaining term. Subscribers coming up for renewal with this issue and the next will be given the option of the standard 1-year renewal or of paying for all the remaining issues. Some subscribers have already paid in advance for multiple-year subscriptions, and any whose terms currently extend beyond June 1999 can expect to receive prorated refunds shortly.

Any questions? Don't hesitate to call or write or email us.

— Bart Hopkin

NOTES FROM HERE AND THERE

AN EXCELLENT NEW RESOURCE for musical instruments people is the *Stranger Creek Instrument Maker's Catalog*. Stranger Creek is a mail-order outfit stocking books and resources on instruments and instrument making. Within its pages most instrument makers are likely to find at least one or two things they had been meaning to pick up but had been unable to locate, and a few more worthwhile items of which they'd not previously been aware. Included are books on piano tuning and organ building, acoustics texts both historical and modern, lots of woodwind books, several sources on historical instruments, how-to-make books for a wide variety of instrument types, books on tools, and more. In addition there is a small section devoted to specialty items for instrument makers, carrying primarily items for woodwind makers and repairers. For information or to request a catalog, contact Stranger Creek at 4641 Lyons Hill, Springdale WA 99173; phone 1-800-450-2502;
email stranger@web-country.com;
website http://www.windworld.com/stranger.



EMI VOLUMES 11 AND 12 NOW IN BOOK FORM

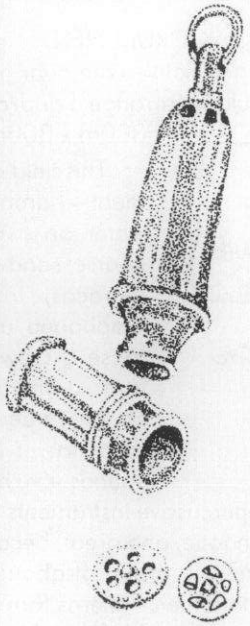
EMI has made it a practice to keep all its back issues in print and available. When the original print run of a given issue sells out, as they all eventually do, we repackage them as bound, photocopied volumes, each volume containing one year of *EMI*. Thus, for instance, the *EMI* Volume I back issue book contains all of the issues from *EMI*'s first year of publication, photocopied and bound under one paperback cover.

In recent weeks, the originals from volumes 11 and 12 have begun to sell out, and so we have now made up bound volumes for those two years. Taking into account this new development, here's the story on back-issues availability:

Issues from *EMI*'s volume 13 and later remain individually available in the original press run at $6 each. The issues from volumes 1 through 12 are no longer individually available, but are available as photocopied, bound volumes, each volume containing one year's worth of *EMI*, at a cost of $17 per volume.

THE HANDSOME DRUMSET in the photo below was designed by Mr. Sándor Kármán, owner of the Drum Museum in Cegled, Hungary. Thanks to Albert Leskowsky for sending the photograph.

SEVERAL STRING INSTRUMENT MAKERS, including both individual luthiers and big manufacturers, have in recent years been producing travel guitars – instruments designed to play like full-sized guitars, but small and light enough to carry in a backpack. Shown on the right below is latest from Martin Guitar Company: the Backpacker® Ukulele. It's all mahogany, and weighs in at 12 ½ ounces.



A hand-held, mouth-blown siren, shown assembled and also with its inner disks exposed. This drawing by Robin Goodfellow was inadvertently omitted in *EMI*'s recent pair of articles on sirens and siren-making. It seemed such a shame to have missed the opportunity to use the drawing that we're taking the better-late-than-never tack of printing it here now.

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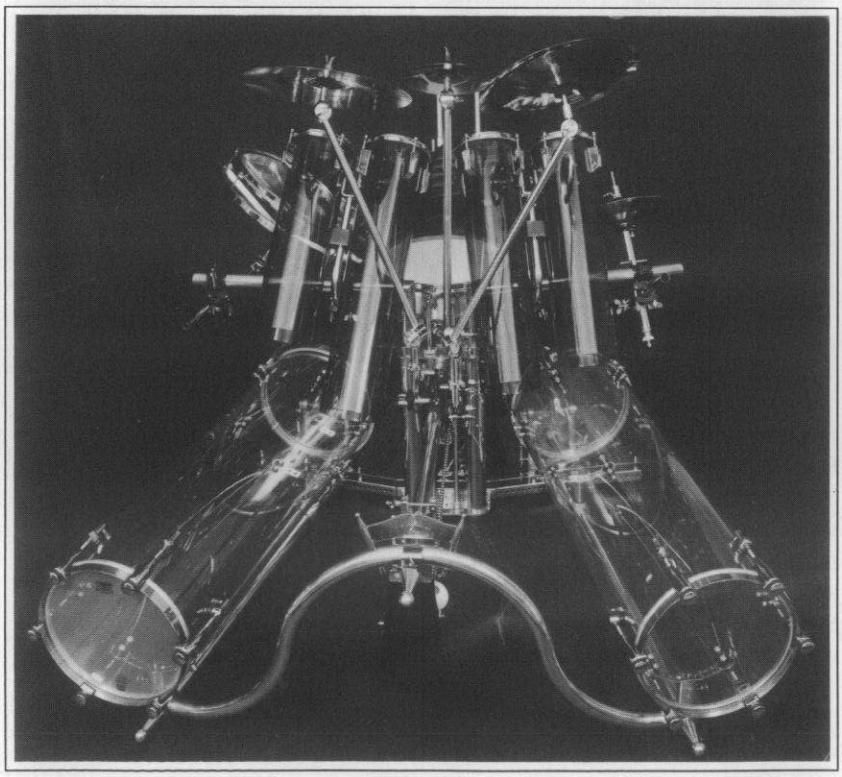
Here are descriptions of five ideas for possible strange sound makers that recently came this way from Sarn Richard Ursell.

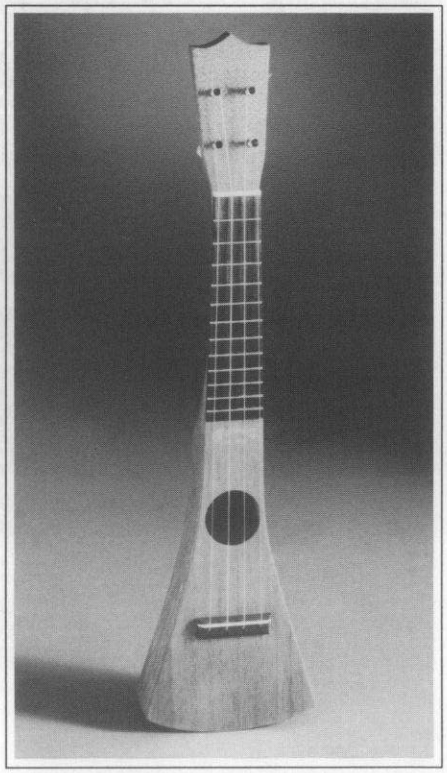
1. "THE ZILTCH" — This is an old musical instrument that could be made with just i) A large chicken wire basket, ii) Methylated spirits, iii) Wadded/rolled up newspaper, iv) Old throw-away plastic bottles/junk plastic, v) Huge bucket of water.

The Ziltch is constructed by hanging the chicken wire basket about 3 meters (10 feet) in the air from the water bucket below, which is filled up with water. The plastic is put into the chicken wire basket, along with the strategically placed wadded newspaper. Methylated spirits are poured generously all over the plastic/newspaper inside the chicken wire basket .The whole thing is then (you guessed it!!!) — set on fire. Stand well clear. It makes the most unusual sound. We could also experiment with various microphone placements — 1)Right by the burning plastic, 2)

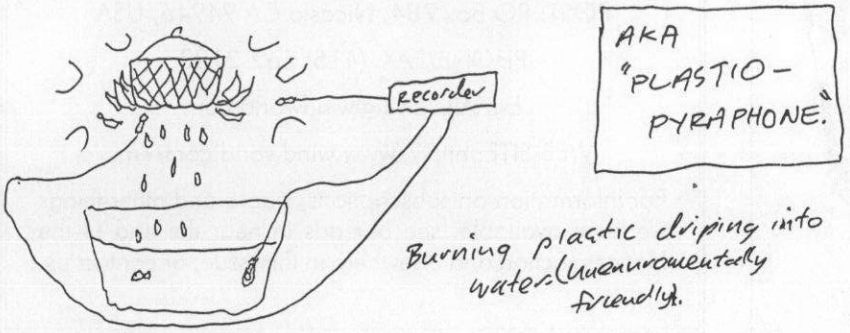


Left: Drumset by Sándor Kármán

Right: Backpacker Ukulele from Martin Guitars



Under the water wrapped in a condom, 3) 3-5 overhead microphones. We could utilize the relative recording positions of many (100?) microphones? Experiment with the relative strengths of the recorded materials on the microphones in the final mixdown.



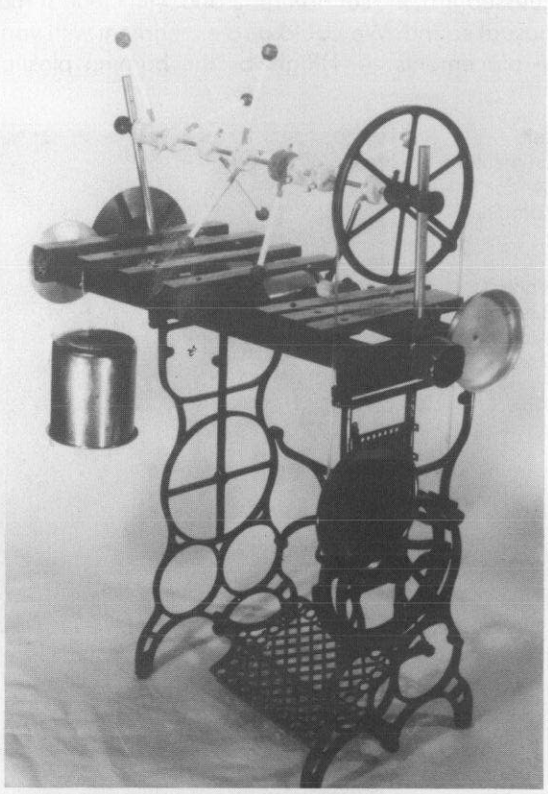
2. "MANDELBROT NOISE" — Could we encode the Mandelbrot set as sound in a graph with the axis-real numbers = time, imaginary numbers = loudness, and iterations to escape coloring via $z:z^2+c$ as frequency?

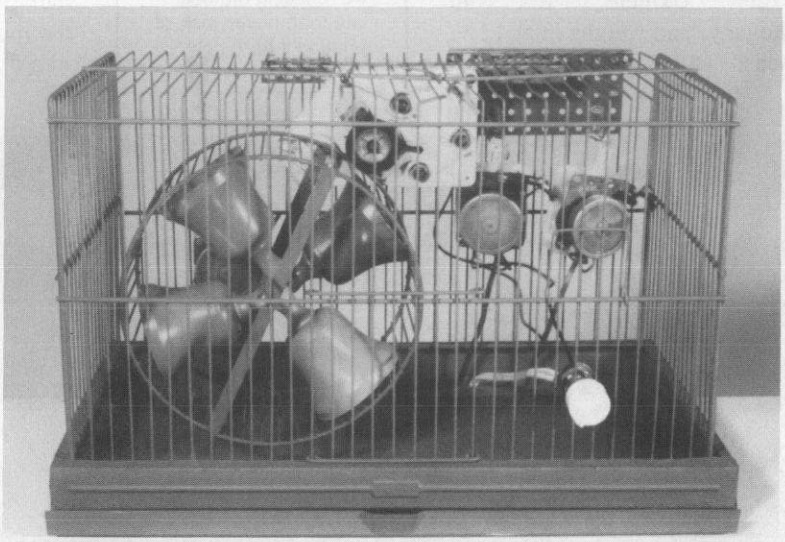
3. "STANDARD GUITAR WITH ATTACHMENTS" — I've experimented here by putting small ceramic beads on the acoustic guitar, but these were heavy and didn't really enhance the sound much. Could we put small triangular shaped portions (so that they don't spin around...) of thin wire around the strings? What about magnetizing them so that they affect the pickups? We may have to put small spherical stoppers on the strings to stop the wire "riding" up and down the strings.

4.JUNK/DRUM FIELD: I got this idea after spending a night at an alternative cafe near my home in Wellington, New Zealand. Could we arrange a grid/graph pattern of microphones in a field, 300m x 300m, each 3m square apart...

This field could be filled full of percussion equipment — drum kits, congas, water drums (half full of water on swaying supports/springs), roofing iron, coarse sand-filled snares, oil drums, water tanks, maracas, "fracta" maracas, and the equipment microphoned up to the eyeballs. We could then let loose a crowd of about 300 people into this field with drum sticks, hammers, sledge hammers, spoons, tree branches, 2x4 wood blocks, and tell them to let loose. The result isn't as crazy as it sounds. I've heard it done with about 50 people and 30 percussive instruments. The effect is chaotic, and great, because occasionally a group of about five get it off together. Patterns form, time signatures form. We could experiment with relative microphone positionings. What about a 3D grid of microphones arranged cubically? 4D arranged in a hypercube (a row of cubes ...)?

We could distort the microphones grid and play back? 10000





FRANK PAHL, a graduate student in the School of Art at University of Michigan, spends most of his time tinkering with instrument making and sound installations. He recently sent along these photos. On the left is the *Automatic Marimba*, with treadle-driven tinker toys striking marimba bars and propane tanks. On the right is *Virtual Pet: Gerbil*, with tuned toy Swiss bells. Frank has made these and other automatons to be performed with, or to be exhibited separately as interactive sound installations. "The beasts in these pictures lack the precision of pieces by someone like Trimpin, whose work I think is exceptional," he comments. "My own music is a bit closer to Pierre Bastien."

track recorder? Iterate the procedure of distortion and playback? Experiment with feedback?

5.GEOMETRICAL AVERAGE SYNTHESIS: Most synthesizers additively average two waveforms with respect to time. Why not multiply them and the take the absolute value and then the square root? Any numbers which were positive before the absolute value was taken could be made negative again later on.

THE PIPELINE FESTIVAL AT PODEWIL

Podewil is an arts presenting organization and cultural center in Berlin. In April of 1997, Podewil sponsored PipeLine, an international festival of creative instrument making, with makers from around the world participating. Friedemann Kawohl and Gordon H. Price have sent the following notes.

A pipeline is a line of interconnecting pipes, used for transporting liquid or gaseous materials over long distances often under the ground. However, the festival *PipeLine* in Berlin's "Podewil" on the first weekends in April was concerned with neither gas nor oil: These pipes contained mainly air. The air columns in the pipes were set vibrating, for the purpose of producing sounds, sometimes resulting in music.

The Israeli percussionist Arik Hayut played with virtuosity on his *biuvon*, an instrument made of Grey PVC pipes, found in every bathroom. Hayut is not only an interpreter but also a composer, and he built the instrument himself. This was a condition for being invited to the "International Festival of Musicians Playing Their Own Instruments Made By Themselves." "Made By Themselves" — sounds like a stamp of quality from a cake shop. But unlike cakes, "self-made" musical instruments are not always better. The motives for making instruments are as different as the musicians invited to Berlin.

An academically educated musician like Hans Carsten Raecke was an exception here. After studies in composition and some free jazz experience in search of new sounds, he came to making musical instruments. His "wind-metal-cam-harp" or "valve-stop-metallophon" are combinations of wind and string instruments.

Originally the ethnomusicologist Susan Rawcliffe learnt the ancient American traditions of making and playing clay flutes in Columbia. While her own constructions are based on the Indian experiences, she tries to avoid imitating any folklore.

Armeno Alberts, a Dutchman, is a composer; his brother Marcel a sculptor. They have been working together for some years, both being fascinated by the "connection between beauty and horror." During their performance "The plagues," they stand in the midst of a circle of twelve high wooden sculptures, on each of which one string is fixed. The strings are worked by hands and tools, and are electrically amplified. The infernal noise could have embellished any ghost train.

The English musicians from "Echo City" have converted yellow polyethylene pipes to make a "batphone." The player bangs on the open end of the pipe with a kind of table tennis bat, the result sounding like a combination of a bass drum and plucked double bass.

Bernd came from Bremen to participate in the Echo City workshop. He is a psychotherapist and uses CD music for his work. Otherwise he does not play an instrument himself; but here he drums and sings. Bernd says, you can make "real stomach music" with the long pipes, and access to the self-made instruments "is spontaneous and original," in contrast to the piano or violin, where the pre-existing aura allows only highly specialized treatment."

Five of eighteen participants in the workshop were physically or mentally disabled. Even getting to know each other became a musical operation. Everyone in rhythm repeated the names of the participants, a little song being the result. The musicians of "Echo City" do not regard themselves as therapists, yet they cause us to forget habitual distinctions. Even the handicapped and

WEB SITES OF INTEREST

The following is a short list of sites on the World Wide Web relating to unusual instruments that have come to *EMI*'s attention recently. Many more are listed in previous issues of *EMI*.

It is becoming increasingly difficult to provide a balanced and complete listing of web sites in any subject area because the explosion of activity on the web has made the process of keeping-up so very time-consuming. But for anyone interested in information on musical instruments, here's an excellent starting point:

http://capella.dur.ac.uk/doug/instruments.html

This site contains an extensive listing of other sites relating to musical instruments of all sorts, arranged by instrument type. Douglas Nunn, the site's creator, also welcomes suggestions and additions. And now on to our regular listing:

Musicians & Instrument Maker's Forum (go to this page to join the forum): http://www.mimf.com

Oddmus (mailing list devoted to unusual instruments -- go to this page to get on the list): http://www.coollist.com/

Bash the Trash homepage (ideas and information about instruments from trash):
http://www/geocities.com/Athens/A cropolis/5732

Innovative keyboard designs, tuning theory & acoustics, computer music interfaces & more from John S. Allen:
http://www.bikexprt.com/users/jsallen/

Harold Fortuin's MIDI controller with alternative keyboard layout:
http://www.wavefront.com/~hfortuin

Northumbrian small pipes: http://web.wt.net/~liestman/

Shrine to Music Museum: http://www.usd.edu/smm

Papers from the August 1997 International Symposium on Musical Acoustics at the Unversity of Edinburgh:
http://www.music.ed.ac.uk/research/conferen ces/isma/

Pixound – software designed to interpret graphic data as sound:
http://www.pixound.com

Wolverine Antique Music Society — antique phonographs:
http://www.teleport.com/~rfrederi/

IBM's patent search engine: http://www.womplex.ibm.com/

Calabrian folk instruments:
http://www.csdim.unical.it/ospiti/stru m_1/strume_e.htm

non-handicapped feel that the rift of speechlessness can be bridged by playing simple patterns. Music is transformed into an irreplaceable form of communication.

Yearning for "the good savage" in music unified the "The 13th Tribe." The 13th tribe which wasn't permitted in Ancient Israel emerged in Berlin in 1990. Werner Durant played a pan flute made of plexiglass, Silvia Ocounge played several guitars laying on a table with knives and forks, and Saam Schlamminger drummed Persian rhythms. In some way everyone present had the feeling they were at an essential archaic ritual, amidst mountains reflecting an unreal echo.Yet there was no musical interplay in that all the musicians played their own echo attachments.

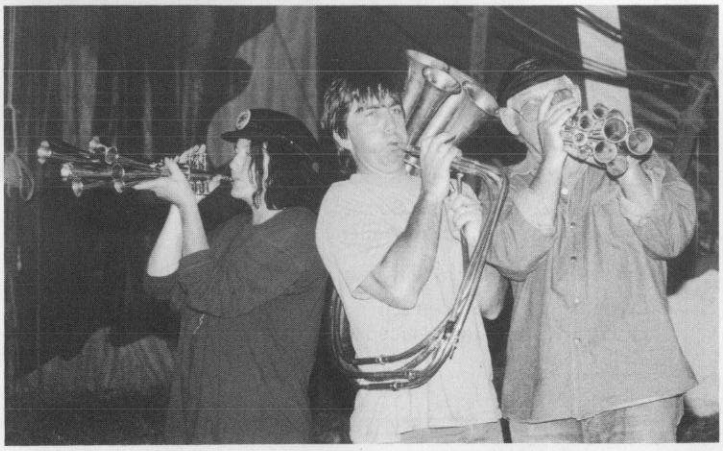
The sounds perceived while entering the foyer of the Podewil were reminiscent of ethnographic material from the Andes. A board hung from the ceiling, to which a plastic recorder and self-made brass flutes were attached. The flautist was the motor from an old vacuum cleaner. The flutes vibrated irregularly over the end of a pipe. This music machine was made by Frederic Le Junter, who also gave several discarded record-players a new musical purpose: In place of an LP record, he sets up a small framework on the turntable. The rotary motion causes a clapper to beat on clay flowerpots at almost uniform intervals. Frederic Le Junter is also a musical clown. Operating his machines with two pedals, he dances and sings, playing on a self-made child's saxophone.

The artists invited were composers, interpreters and instrument makers. Above all, they were travelling entertainers.

While the musicologist Curt Sachs, the famous systematist of musical instruments, did not know PVC, what he said sixty years ago about "musical pleasure-makers" of the Middle Ages would also have been fitting for this festival:

"Ancient rhythmic instincts were united with the wish to present several things simultaneously; of demonstrating dexterity that gratifies the audience's need for multifarious impressions".

Left
Gypsy Pennefeather and friends with the refurbished Deagan Organ Chimes.



Below:
Schalmei (the 20th century German instrument, not the early wind instrument).

Back in *EMI*'s December 1993 issue (Volume IX #2) we had an article on the remarkable chromatic metal angklung-like instrument manufactured in the early years of this century by the J.C. Deagan company under the name Deagan Organ Chimes. Since then we've occasionally run brief reports on surviving Organ Chimes sets in different locations. Here, thanks to Gypsy Pennefeather, is a report on a set found half way around the world from its point of manufacture.

THE NEW ZEALAND DEAGAN ORGAN CHIMES

In 1995 a strange rusty contraption came into my possession. Found in a stable in the New Zealand countryside, and draped with oilskins, harnesses and a few fan belts, this mess of metal and wood looked very big and very dirty. As I was interested in experimental music, I purchased this home-made-looking affair for the unique bell-like sound it produced when I gingerly shook one of its hanging racks.

No one wanted to help me clean it, so I enlisted the services of a retired circus acrobat who made his own props and loved working with metal. Over four months' careful restoration, he revealed a set of Deagan Organ Chimes in remarkably good condition, complete with patent marking, and dated 1901.

Of course, we didn't know what the instrument was called, but finding reference to a large Deagan "angklung" in a dictionary of musical instrument makers, I eventually made contact with Bart Hopkin of *EMI* through the Shrine to Music Museum in South Dakota.

Further research has shown that these chimes, made in Chicago in 1901, were originally bought by English orchestral conductor, Arthur Lupton, who later moved to New Zealand. Arthur played the violin. He married Nana whom he met in New Zealand. Nana was a magician and had Madam Karno's Punch and Judy Show and performing monkeys. Of their two daughters, Rona, played saxophone. Fuschia played drums, and both girls danced and sang. The family traveled throughout New Zealand with the chimes in a horse and cart, performing in town halls, under the name "The Jubilee Bell Ringers."

For the past fifty years the chimes have been in disuse,

which would account for the lack of bumps and dents, stored firstly in a big carnival storage shed, then from 1989 until 1995 in an old stable.

I have made several delightful recordings of the Deagan Organ Chimes and also given several concerts with them. As these chimes are tuned to a high pitch standard, they blend beautifully with instruments with adjustable pitch, such as a digital keyboard or any stringed instrument which can be tuned with the help of a digital tuner.

I later had the chimes nickel-plated back to original and performed with them as a musical clown in Ashtons Circus in Australia. Whilst at the circus I expressed a desire to obtain another odd instrument featured in a poster sent to me by the Circus World Museum, Wisconsin. I found that this was called a schalmei horn. It is a reed and valve instrument, made in Germany. They came in a set of five visually interesting shapes, playable in one key only. A set was obtained for me to use, but I would be keen to know more about their history. [See the picture, previous page. For just a bit more information about this instrument, see correspondence appearing in the letters sections of Volume VIII #4 and Vol. IX #1. – ed.]

I also purchased a 1938 Harmony Monterey 4-string tenor guitar, a set of Deagan cowbells and some other little hand-bells from the same source as the chimes, but they were all in poor condition. I also found two sets of Deagan wooden xylophones, one high-pitch, one low-pitch, but again in poor condition. Amazing that all these American instruments found their way out here and that I located them all from within a thirty-mile radius!

— Gypsy Pennefeather

ray wilding-white

MONDAY MORNING AT THE GARGOYLE WORKS

Five Players: A B C D & E
Five regular wood chairs with back slats (Wood chairs on a wood floor have given the best harsh raspy sound. other chairs can be tried)
One child' chair
Sit (or 1/2 sit) Line indicates direction chair faces
Designated player stands
Play on chair with: Hands
Hard Mallet
Soft or Timp Mallet
Wire Brush
Push chair standing
Push chair while seated on it
Bounce chair while seated and moving
xxxx Rattle chair seated
Rattle chair standing
Rattle chair legs together
Bang chair
----- Move chair quietly
Horse straddle

Though not mandatory, preferably A D & E are men and B & C women

The diagrams indicate the stage area. Both the actions and the sounds are indicated. Action is, of course, continuous

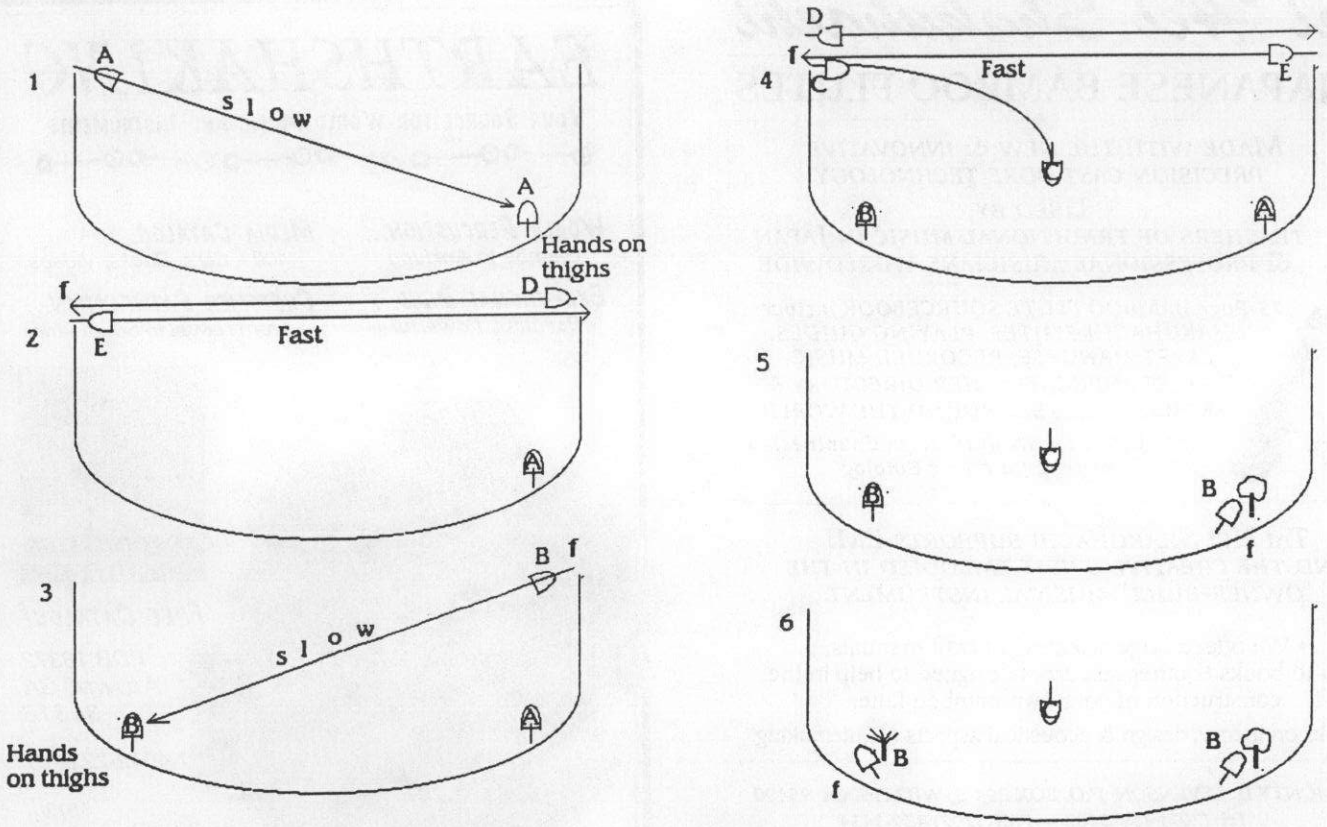
In his introduction to the book *Gravikords, Whirlies & Pyrophones*, Tom Waits comments on the sound possibilities to be had from dragging a chair across a floor. Seeing this, Ray Wilding-White was reminded of a piece he wrote some years ago. He sends the following notes.

INTRODUCTION TO *MONDAY MORNING AT THE GARGOYLE WORKS*

In 1968 I was directing the Case Institute Concerts of Experimental Music in which, amongst other things, I did a number of John Cage pieces. On a radio round-table, the program annotator of the Cleveland Orchestra, Klaus Roy, who had not taken kindly to these pieces, said in effect: "You might as well call *this* music" and got up and pushed his chair across the floor creating a loud scraping sound.

I left Cleveland that year but the remark stuck in my mind along with the thought "Why not?". Thus I created a piece for chairs — scraped, rattled, sat on, etc. — and presented it on a Loop Group concert. It was not only well received but Norman Pellegrini, program manager for the Fine Arts Station WFMT-FM, recorded it separately and broadcast it.

Since the entire 13-page score would take too much room in this magazine, herewith are some samples along with the list of symbols. Anyone who wants to perform it need only send me a stamped, self-addressed 9x12 envelope at Ray Wilding-White, 408 Wisconsin Ave., Kewaunee WI 54216. There is no charge *but*, since the material is under copyright, proper credits must appear on programs and concert literature and publicity.

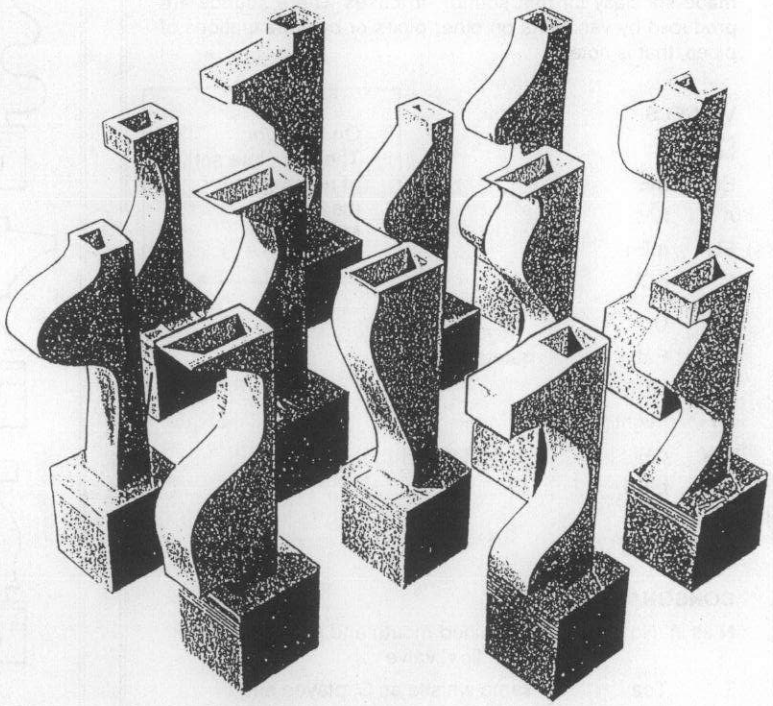


Ray Wilding-White's *Monday Morning at the Gargoyle Works*, scored for five players with five chairs.
This is a sampling only, being the first six actions of the thirty-three that make up the piece.

This is the second of two articles by Martin Riches on speech synthesis. In the first article, which appeared in EMI's last issue, Martin provided a basic grounding in the mechanics of speech production, and described four important historical synthetic speech devices. This second article is devoted to The Talking Machine, the mechanical speech synthesizer that Martin himself has been making.

THE TALKING MACHINE
A Mechanical Speech Synthesizer

By Martin Riches



While I was voicing some pipes I had made for a computer-controlled organ, I noticed that when they were badly adjusted — playing with too much attack or "chiff" — they sometimes made sounds quite similar to human speech. I wondered what would happen if I replaced all these organ pipes with pipes that were especially designed to make speech sounds and whether this new organ could be taught to speak.

With this at the back of my mind, in 1990 I applied for a grant from a local arts authority to make a talking machine. It was something of a shock when I learnt that I had secured the grant; I was now under considerable pressure to produce a working mechanical speech synthesizer.

At first I had hoped to make a single mouth with a mobile tongue and lips which would speak all the vowels, semi-vowels, nasals and glides. Those consonants which need air-tight closures, the plosives, *P-B*, *T-D*, and *K-G*, could, if necessary, be spoken by additional instruments. I made a rough, hand-operated model which spoke 12 English vowels. But, being under pressure to succeed, this single mouth approach seemed too risky for a first attempt.[1]

Since I was starting the project in a state of utter ignorance, I followed the strategy of making a separate instrument for every single speech sound. This seemed to be a cautious step-by-step method which might be expected to produce at least partial success. I already had a suitable air supply and control system available — my computer-driven pipe organ — so all that needed to be done was to make the instruments themselves, fit them into the organ in place of the organ pipes and rewrite the software to deal with words instead of music. As it turned out, this approach worked quite well.

This machine has a larger repertoire of vowel sounds than Professor Kratzenstein's five resonators (described in last issue's article on historical talking machines), but although I used a different kind of reed, the vowel sounds are produced in much the same way. In fact, apart from the electrics and electronics, the machine could have been built in the 18th century. They would probably have programmed it using a pinned cylinder like that in a mechanical organ.

A vowel pipe consists of a simple organ reed corresponding to our vocal chords, and above it a wooden resonator that reproduces the spaces we make inside our mouth when we speak. The resonators are based on measurements of X-ray photographs taken of a person speaking.

The machine's intelligibility is based on the ear's ability to accept jumps from one sound to the next in much the same way as the eye merges the jumps from one picture to the next when watching a film. I did not follow my "one-sound-per-instrument" principle consistently: a few instruments have an additional valve which performs the function of the lips and changes the sound, as in "m-er". Also, some of the fricatives *F*, *S*, *SH*, *CH*, *T* etc. are produced by combinations of instruments playing together.

Each instrument consists of two components: a noise maker (special whistles in the case of the fricatives and metal reeds for the rest) and a wooden resonator which filters this noise into the required sound. The resonators resemble the shapes made by the mouth and throat when speaking. Making the resonators required the accumulation and processing of a quantity of anatomical, acoustical and phonetic information. The following methods were used:

1. Reading up the subject and consulting experts. (See bibliography and acknowledgments).

1. I have in the meantime returned to the idea of a single fully motorized mouth. Its finest achievement so far is to speak, quite clearly, the vowels-only sentence "You weigh our air. We owe you our awe", (addressed to Torricelli, the inventor of the barometer). Examples of other long vowel-only sentences will be gratefully received. I am currently working on the consonants.

STANDARD BRITISH ENGLISH

A checklist of speech sounds used while building the voice pipes

The vowels and consonants are listed in order of their frequency of occurrence in English and this was, largely, the order in which the pipes were built. Generally, in the Talking Machine, each sound is produced by a single resonator pipe made specially for that sound. In cases where sounds are produced by variations on other pipes or by combinations of pipes, that is noted.

VOWELS

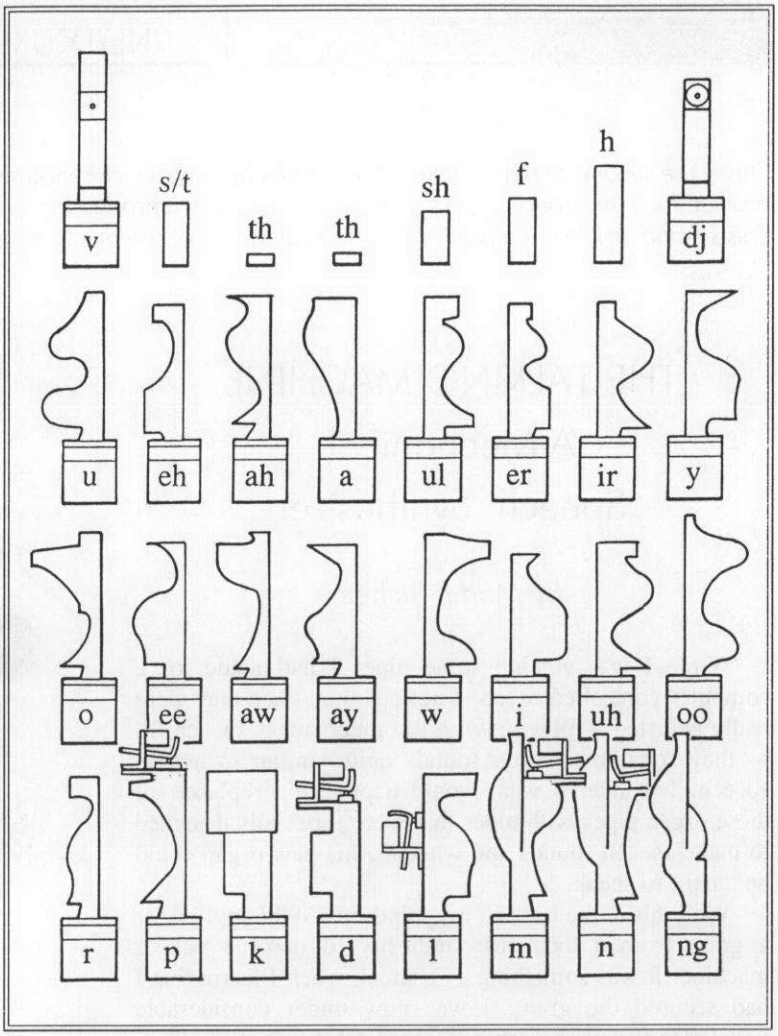
I as in It		
ER	thE	
A	hAt	
EH	mEn	
O	nOt	
U	Up	
EE	Eat	quietest vowel
OO	blUE	
AY	mIght	
AW	cAll	loudest vowel
IR	bIRd	
UH	pUt	
AH	cAlm	

CONSONANTS

N as in No		combined mouth and nose resonator with "lips" valve
T	Tea	same whistle as S, played short
R	Red	usually rolled with the software
S	Sun	whistle
D	Day	same whistle as S, played very sort T
L	Leaf	
TH	THen	2 whistles together with voice
Z	Zoo	a V and an S together with voice
M	Make	combined mouth and nose resonator with "lips" valve
K	Cold	a light percussive click
V	Vain	reed pipe with built-in whistle
W	Wine	first part of W, like an OO but less rounded lips
P	Pay	a soft percussive pop sound
UL	tabLe	dark L
F	Foot	whistle
H	Hard	a tube resonator
B	Boat	as P, with more voice
NG	siNG	combined mouth and nose resonator
SH	SHow	4 whistles together
G	Go	R and L played together
Y	You	a very narrow EE.
CH	CHurCH	combination of t and sh
DZ	JuDGe	reed pipe with built-in whistle
Th	THin	softest sound, 1 soft whistle

37 speech sounds: 13 vowels, 24 consonants (16 voiced; 8 unvoiced), 10 fricatives.

On the right: The complete set of resonators for the Talking Machine.



2. Observations using a dentist's mirror and a pair of calipers.

3. X-ray data.

4. Calculation using acoustic formulae and tables.

5. Experiments with an adjustable resonator and a model mouth.

6. Interpolation between existing resonators.

7. Luck; a few resonators which would not make the hoped-for sound turned out to be just right for others.

My basic technique was to take a diagram of a cross-section of the human mouth based on X-ray data, photocopy it up to full size, tack it to two layers of 3-ply, cut them to shape on a bandsaw and use them as two sides of a resonator. The third side was a rectangular piece of plywood while the curvilinear fourth side was made of flexible 1 mm. plywood. A few of these resonators worked perfectly first time. Most required a good deal of tweaking and tuning and rebuilding; I accumulated many rejects.

My main problem was that the work was tiring for the ears. It was difficult to remain objective; after a few hearings, it was all too easy to convince one's self that the sounds which emerged were correct. I had to keep the listening sessions very short and consciously try to maintain a positive and patient attitude. It was perhaps particularly frustrating because the resonators were undoubtedly producing human speech sounds — of a sort — and it was easy to imagine that one was confronted by a most intractable human personality. Fortunately, I was able to

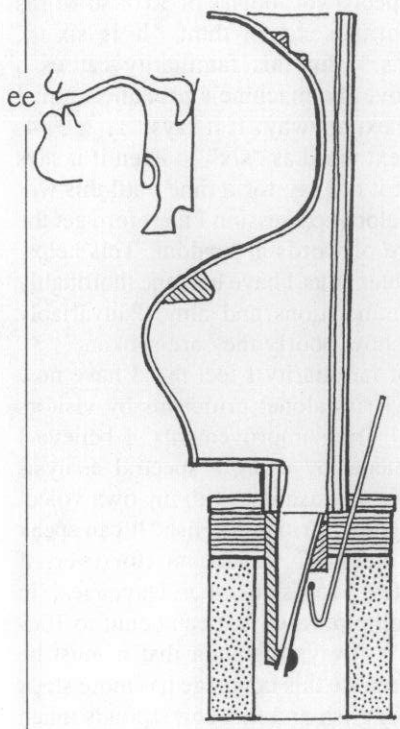


Fig. #1. The EE pipe reproduces the narrow shape of the human mouth saying EE. On the left beside the pipe diagram: cross section of the vocal tract producing the same vowel EE.

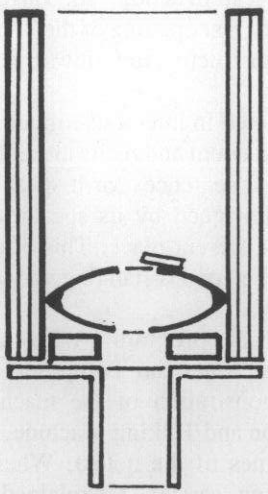


Fig. #2. S/T pipe. If this pipe is played continuously it will produce an S sound. Played short it will speak a light T. The small piece of metal fixed over one side of the opening changes the sound of the whistle to a hiss. The other fricative pipes are similar, except the *H* which is just an empty resonator.

intersperse the tuning sessions with work on the software.

The resonators had to work together as a set — like the pipes of an organ — so finally I had to tune each reed pipe to the same pitch and balance all them all in loudness and timbre. Building the resonators took several months.

During the early stages of tuning the resonators I had a fascinating session with an elocutionist, Honor Kovacs. She treated the machine exactly like one of her human pupils. For example: she would ask the machine to say AW and I would then play that pipe. "Well now," she would say, "if you could just try moving the tip of your tongue up a little bit and say it again?" I would then quickly change the shape of the pipe using plasticene and she would say "Yes, not bad" or perhaps "No, too much." This session gave me many insights and brought the dry acoustic theory to life for me.

Fortunately, as we saw with Kratzenstein's pipes, it is not necessary to reproduce the complex shapes made by the mouth exactly. The proportionally correct cross-sectional area at each point along the vocal tract is decisive — but the shape of that cross-section is relatively unimportant.[2] The actual shape of the cross-section was largely decided by fabrication techniques and, for me — working in plywood with a circular saw and a band-saw — rectangular sectioned pipes were easiest to build. I had initially experimented with Plasticine (not permanent enough), high density styrofoam (good but equally impermanent), and polyester resin (difficult to change and I find it unpleasant to work with). Some resonators are fitted with internal details to reproduce the velum, teeth and epiglottis. Some are partially lined with felt to increase damping.

The reeds are made of hammered brass sheet, held in position over the spoon-like kelch with a wedge. This is the method used in reed organ pipes. However the rim of the kelch is lined with thin leather making the sound less harsh. Because of my lack of experience in reed-making, not all my reeds have exactly the same timbre. I exploited this deficiency by taking care to match reeds and resonators. For example, the EE resonator would be matched to an EE-like sounding reed. This EE-reed would be unsuitable for the AW resonator because the characteristic AW frequencies would be missing or weak.

What about the consonants? The *S*, *F*, *SH* and similar sounds — the fricatives — are produced by special hissing whistles. These whistles are prevented from making a full musical whistling sound by small obstructions added to divert the air flow.[3]

Other pipes have "noses" added to them and this enables them to speak the nasals: the *M*, *N* and *NG* sounds. The *M* and *N* pipes have additional valves, the equivalent of opening lips so that they can say "m-er" and "n-er"

The most obstinate sound was *K*. Finally, I had to resort to a percussive click, wood on leathered wood inside a resonator. I later learnt to "suggest" the softer varieties of *K* by using a small pause followed by a release of air. The *P* sound is produced by a soft rubber valve cover which slaps a hole in a resonator making a faint popping noise — the same effect as slapping the rounded lips with the fingers.

The problem with the plosives, *K* and *G*, *P* and *B*, was that in natural speech they require a higher pressure and this is not normally available from the organ blower. Indeed, the blower and its magazine bellows are designed to keep the pressure exactly constant. It would however be possible to instantly raise the pressure by adding a mechanism to close the regulating valve and press heavily down on the bellows.

Many of the other problems with consonants could be solved by the programming of the controlling computer.

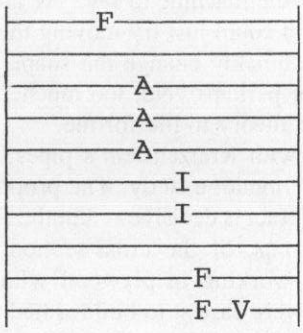
PROGRAMMING

The whistles which produce the unvoiced sounds, *F*, *T*, *S*, *SH*, *CH* etc., speak fast; the reed pipes for the voiced sounds are slower. Some of the reeds have to be blown for an appreciable amount of time before they start to speak. This applies especially to narrow vowels

2. Having once built a square-sectioned flute I would venture to say that a flute is recognizable as a flute whether the tube is round or square.

3. The whistles are based on Venezuelan duck-calls. This was a fortunate misunderstanding: I had asked a friend in Caracas for a duck-call. I expected to be sent something with a reed but — to my surprise — received a paper bag full of little whistles labeled "Pitos para patos": whistles for ducks. These are quite different from the familiar mallard duck-calls — they are just pairs of dished aluminum washers glued together. Presumably they attract non-quacking varieties of duck such as pintail or widgeon; my local mallards ignore them. The dimensions are not critical; I was told that red-blooded Venezuelan males hand-craft their own whistles out of the metal ends of spent shotgun cartridges.

such as EE and OO which offer more resistance to the flow of air. The machine therefore has to start playing the more reluctant instruments well in advance so that they will start speaking on cue. If it plays too late, there is a gap. If it plays too soon there is an overlap with the previous pipe, producing a curious choric effect. Each pipe has its own program variable to tell the computer how much lead it requires before it speaks.



To help me program a word I ask the computer to produce a graphic display which, simplified, looks like this: →

This is what "five" looks like. This graphic display helps me visualize the relative length of the sounds. Note the *AI* diphthong, the intentional gaps between the fricatives and the vowels and the simultaneous *F* and *V* sounds at the end. This diagram does not show how much the pipes have to be blown in advance. The computer takes care of that for me automatically.

This diagram is a little reminiscent of a Pianola music roll. Indeed the machine could also be driven mechanically (by a barrel organ or player-piano mechanism); the reason for using a computer is that it is far easier to make changes in the timing if the machine mispronounces a word and, in any case, a computer is far more flexible and reliable than a music-roll reader. To operate the machine the sentence to be spoken is typed into the computer. It then consults its pronunciation dictionary and if it finds the words there it will speak them. The actual pronunciation instructions for the word "five" as shown above would be: F1 1 A3 I2 1 F1 FV1. Letters indicate pipes, numbers are durations or pauses.

I think that one of the reasons that the great mechanical talking machines of the past took such a very long time to complete — von Kempelen (1791) and Prof. Faber (1830) both worked for over 20 years on their machines — is that they did not have such a readily adaptable method of programming a machine, so they had to learn to play their machines by hand. A further problem: although no tactile sensation is more familiar to us than the feeling of the insides of our mouths, before the discovery of X-rays it must have been extraordinarily difficult to assess the volumes produced inside the mouth while speaking.

My machine always speaks at the same pitch: 220 Hz. — a tenor. I have not yet attempted to provide stress or intonation so the machine would not distinguish between the two sentences "You understand" and "You understand?" But it could be done by modulating the air pressure to change the pitch (and volume). It is also easy to change the emphasis by altering the tempo at which the words are spoken: "Y o u understand". The machine leaves a 1/5 of a second pause between all words and does not speak with mostofthewords joinedtogether aswedoinEnglish. Separating all the words certainly improves intelligibility but it also sounds rather deliberate.

Intelligibility is also dependent on context. For example, it is relatively easy to understand the machine when it is telling the time. We know that we can expect a vocabulary of 30 or so words arranged in a well-known format and rhythm: "It is six ... forty-five ... and ten seconds." But this familiarity causes a problem when trying to improve the machine's pronunciation: I know what it is going to say next anyway. If it says "1, 2, 3, 4, 5,.." I am going to hear the next word as "six" — even if it says "tigz" (which is, in fact, what it did say for a time until this was pointed out to me). During an elocution session I therefore get the machine to speak its repertoire of words at random. This helps, but does not overcome the problem that I have become thoroughly accustomed to all its mispronunciations and almost invariably recognize all words no matter how poorly they are spoken.[4]

Because of this problem of familiarity I feel that I have now gone as far as I can using my ears alone; criticisms by visitors with good analytical ears still bring improvements. I believe I could make further improvements by using a spectral analysis program to objectively compare the machine with my own voice.

The machine's mother tongue is British English. It can speak some 400 words, can recite the ABC, can count (for ever, if necessary) and can speak a few words in other languages. In Japanese it can speak a few polite phrases and can count to 100. It can also count in German. I always maintain that it must be particularly adept at German because this language has more stops and purer vowel sounds than English and this corresponds much better to its style of speaking. My German friends disagree: the problem is that foreign languages are spoken with a British accent; the foreign sounds are missing. For example: it cannot not say "un bon vin" because it has no nasal vowels. Nor — sadly — can it speak Chinese where pitch is essential to meaning.

It has taken part in many concerts (reciting), and has been exhibited many times in Germany (where it lives), and also in Japan. It is quite entertaining to watch: all the instruments are visible, and the wind chests are transparent so that the valves which control the flow of air can be seen in action. The valves are fitted with LEDs so that even the very fast opening of the T valves can be recognized. It is particularly instructive to follow repetitive speech like counting.

The machine is sometimes exhibited in interactive mode. The public can use the keyboard to make it count and recite the alphabet and various poems and can also input sentences for it speak.

The public seems particularly intrigued by its speaking "in stereo": each sound comes from a different place. This effect is of course particularly pronounced when one is standing very close to the machine.

The machine was featured in a radio program "A Talk about Talking" which I made with the American composer Tom Johnson. The talk includes a demonstration of the machine's capabilities and five duets for bassoon and Talking Machine. (The machine counts and recites the names of the notes). When the bassoonist arrived for the recording session I explained and demonstrated the machine for him at some length. When I had finished he nodded vigorously and said "Ja, Ja ... So now show me: where is the loudspeaker?"

4. This is the situation of the mother of a very young child — the only person who understands what her offspring is trying to say: "Gimimohnook." "Oh, you would like me to give you some more milk, would you?" "Yurg." Speech recognition is a far more complex skill than speech production; the listener does most of the work.

My warmest thanks go to the following for inspiration, information and helping in all sorts of ways:

Prof. Manfred Krause, Dipl.Ing. Folkmar Hein and Dipl.Ing. Klaus Hobohm of the Technical University, Berlin; Jasia Reichardt, art organiser and writer,

London; Peter Richards and the staff of the Exploratorium, San Francisco; the staff of the Instituut voor fonetische Wetenschap, Amsterdam; Renate Bonn, Berlin and Francisco Flores, Caracas; Prof. Remko Scha of the Institute for Computer Linguistics, Amsterdam; Hanns Zischler, Berlin; George Sassoon, Loch Blue, Scotland.

Patient and critical listeners have included Yumiko Urae, Alex Veness, James Tenney and elocutionist Honor Kovacs.

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Jasia Reichardt: *Robots. Fact, Fiction & Prediction.* Thames & Hudson, 1978 Excellent history, illustrations and narrative. A continuing inspiration.

Born on the Isle of Wight, England, in 1942, Martin Riches studied at the Architectural Association in London and practiced architecture until 1978. Since then he has worked exclusively as an artist. Since 1975 he has built a series of machines which emulate fundamental human activities: walking, drawing, writing, talking, and making music; also Sound Sculptures and Sound Installations. His Music Machines have inspired many composers to write for them. He lives and works in Berlin.

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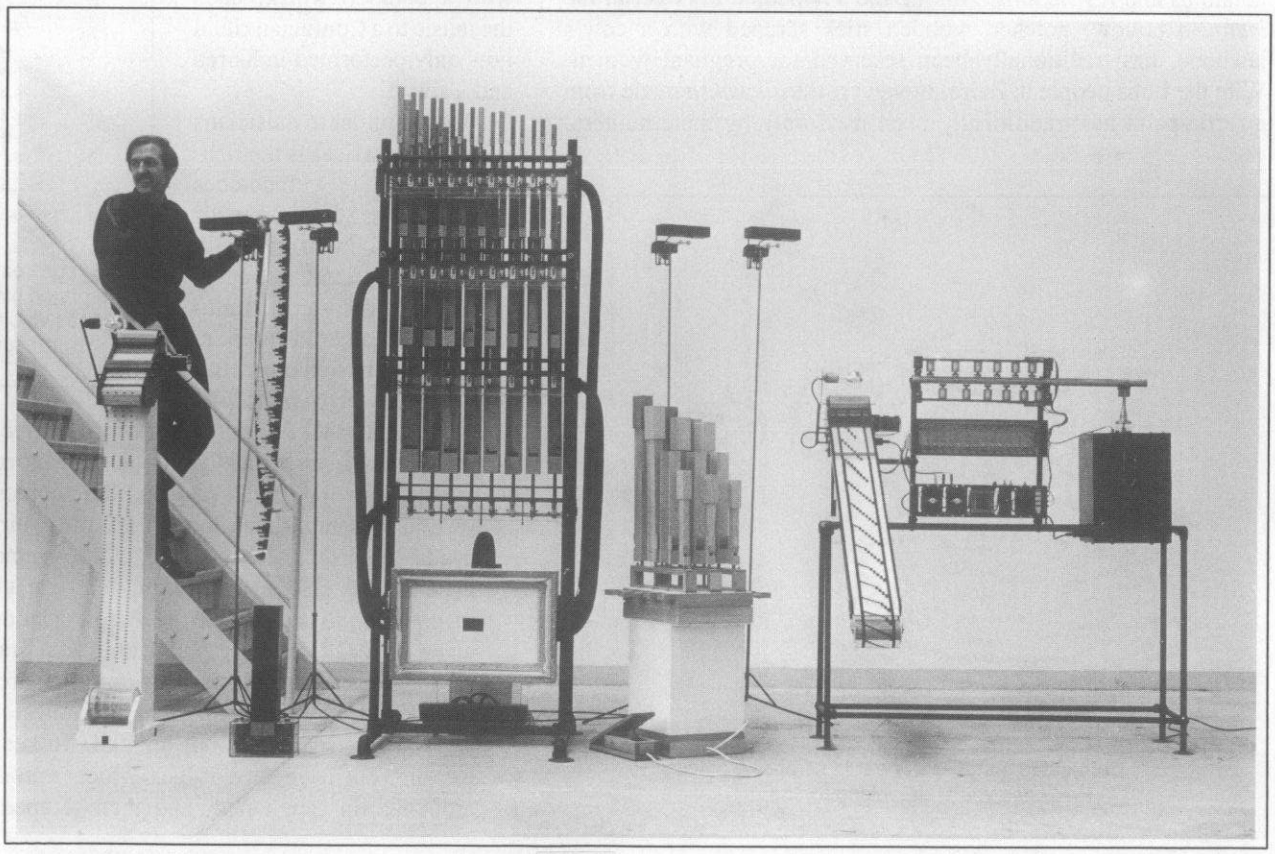


MARTIN RICHES WITH SOME OF HIS MUSIC MACHINES.

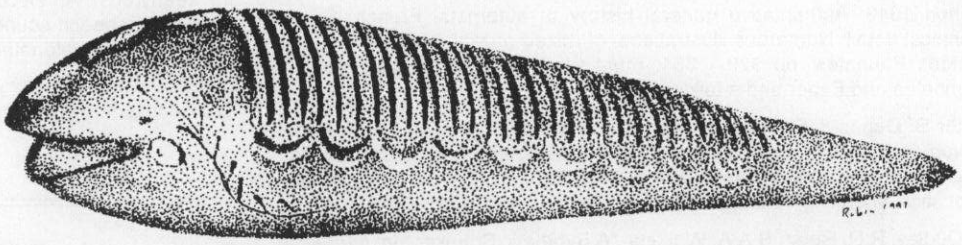
L to R:
A percussion machine, a mechanical organ, a small blower with 12 pipes, 4 stops and 3 pedals, and a flute-playing machine.

The wind chests, blower and frame of the mechanical organ form the basis of the Talking Machine.

This is the second in a series of illustrated articles from Robin Goodfellow now appearing in Experimental Musical Instruments. Each article presents an idea for a musical instrument simple enough to be made by children. In addition, each article contains the raw material for a lesson plan built around the instrument, including rudimentary principles of sound, elements of cultural lore, and a song with which the instrument can be used. In this second in the series, Robin presents instruments played by scraping.

SCRAPPY SCRAPERS

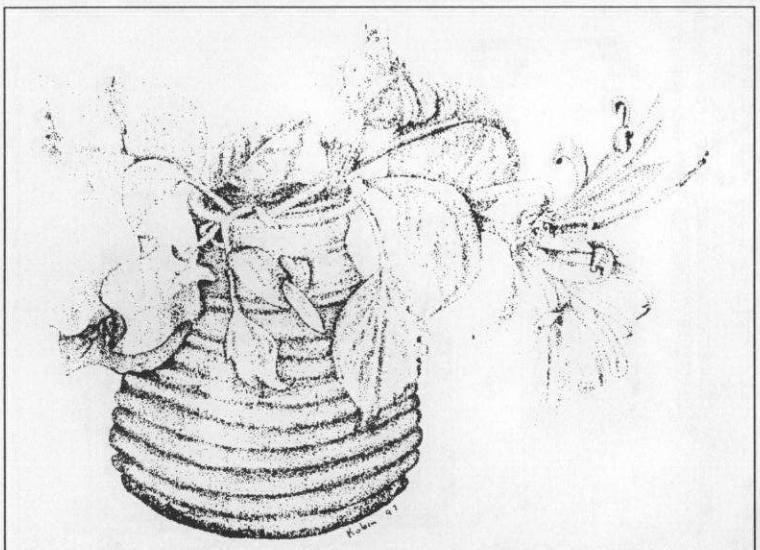
Text and drawings by Robin Goodfellow



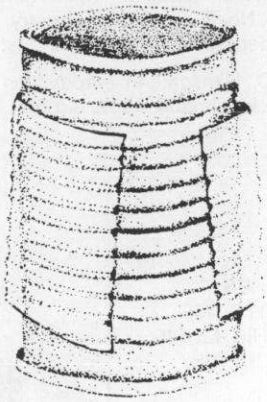
Gourd scraper

What is the connection between a turtle shell, a gourd with many slashes, a wooden tiger with 27 ridges in its back and the corrugated cardboard that is wrapped around your light bulbs as you carry them home from the store?

EMI readers will undoubtedly see the obvious connection of ridged surfaces. The principle of producing sound by scraping an object across a ridged, scored or roughened surface is quite ancient. Changing according to the locale and the available materials, scraped instruments have taken on extra-musical connotations and restrictions. Among the Tiv people in Nigeria, the *ivuur,* a hollow, notched wooden stick scraped with a cow's jawbone, has traditionally been reserved for pregnant women. With the Luba people in Zaire, however, the *dikwaksa* made from a raffia-palm has traditionally been used only by male hunters, who vigorously rub a strong, thin stick inside a notched slit in the palm branch. Initiation rites, rain request ceremonies and offerings to deities are among the occupations for scraped instruments around the world. Some are so specialized as to be used only in rare ceremonies, such as the *O*, the Korean form of *Yu*, the ridged-back tiger mention above, who, when stroked with a bamboo whisk, ends the music to a Confucian ritual now only performed in Korea and Taiwan.



Corrugated surfaces appear in surprising places once you start looking for them.



Tin can partially wrapped in ridged plastic mat to provide two different scraping surfaces.

Most familiar to musicians in the Americas is the fish-shaped gourd with notches in its back. Scraped gourds are found in many Latin American countries. They have acquired an accumulation of names to entertain the ethnomusicologist. But what does the *charrasca* of Venezuela, the *omichicahuaztili* of Aztec Mexico, or the *rasqueta* of Ecuador have to do with the corrugated cardboard around your light bulbs? Just as the peoples of the world for several millennia have looked around their environment for available music makers, so we in cities removed from natural materials search our surroundings and use what is at hand. Just as the *natmat woywoy* in the Banks islands of Melanesia is made of local stone scraped with a leaf stalk, so corrugated cardboard is among the usable scraps that are sources of ridged surfaces for us North American urbanites.

The plastic runners put on stairs to keep the carpet from wearing out have nice ridges which sound well if wrapped around a tin can, taped, and then scraped with chopsticks.

Leave some of the tin can exposed, producing two different scraped sounds: the plastic and the tin can itself.

Tin cans without any additions are natural *raspadores*, to use a Latin American name. Again, chopsticks work well, but experiment with anything at hand and notice the differences in sound: paintbrushes, dinner knives, popsicle sticks, twisted wire; try anything!

Many plastic containers for cookies, crackers and candies have ridges to strengthen their structures. These can be quite resonant when stroked. Other corrugated surfaces besides light bulb holders produce different sounds. Corrugated surfaces appear in surprising places when you start looking for them.

The instruments I use for demonstrating scraped idiophones include three gourd fish painted in bright colors, a metal *torpedo* with a very loud sound, three sizes of cheese graters, a washboard, cookie packaging, light bulb protectors, a long spring held between two screw eyes, and various ribbed tin cans. I have two guiros from a child's instrument set, ridged rhythm sticks, sandpaper over blocks, and plastic window screen.

"Vamos a la Mar" ("Let's Go to the Ocean" — see the score below) is a good song to use with the fish guiros for young children. Scrape on the words "tum tum." "Marching" (score also below) is set off nicely with the cheese graters for teaching beat, rhythm or ostinato depending on the sophistication of the students.

Scrapers are rarely solo instruments, and that may account for a noticeable lack of story material surrounding their manufacture or origins. There is plenty of lore, but as yet, no folk stories for scraped idiophones that I have found. (If readers know of any stories in which a scraped instrument is prominent, I would appreciate hearing from you through *EMI*. I am also collecting folk tales of other instrument families as well.)

Finding scraped idiophones is a matter of seeing what is there. If the flower vase has ridges, try it! Do not be shy about playing music seriously on supposedly non-serious instruments. We are not thinking Toy Symphony here, but the truly serious *L'Enfant et les Sortfleges* by Ravel, no less, with a scraped cheese grater written into the score! On the other hand a few more toy symphonies in the repertoire might be a very good thing!

So scrape together a sack of scraps and make some scrappy scrapers!

Robin Goodfellow is the director of Mandala Fluteworks, a studio of music and art in Oakland, CA. She has been teaching children and adults for many years, and plays flute, piccolo and tin whistle among other instruments. She is the original founder of the Queen's Ha'Penny Consort, a recorder and early instrument group that specializes in the performance of Rennaissance music.

Robin draws from her extensive collection of musical instruments to provide illustrations and articles for EMI, where she has been a regular contributor for eleven years. She is developing a set of notecards featuring her drawings of instruments, most of which have appeared on the pages of EMI.

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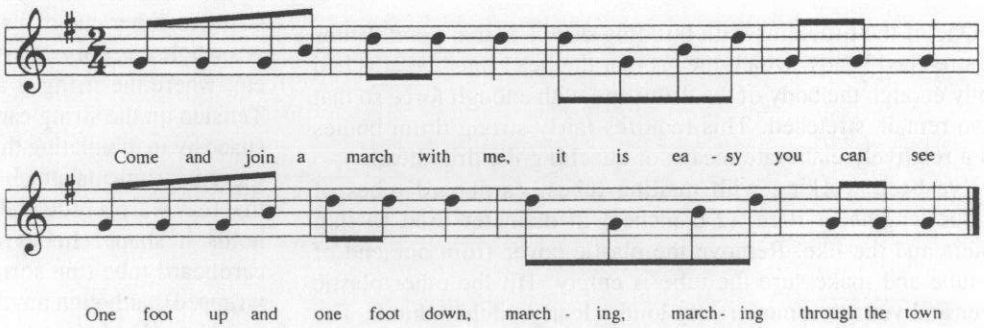
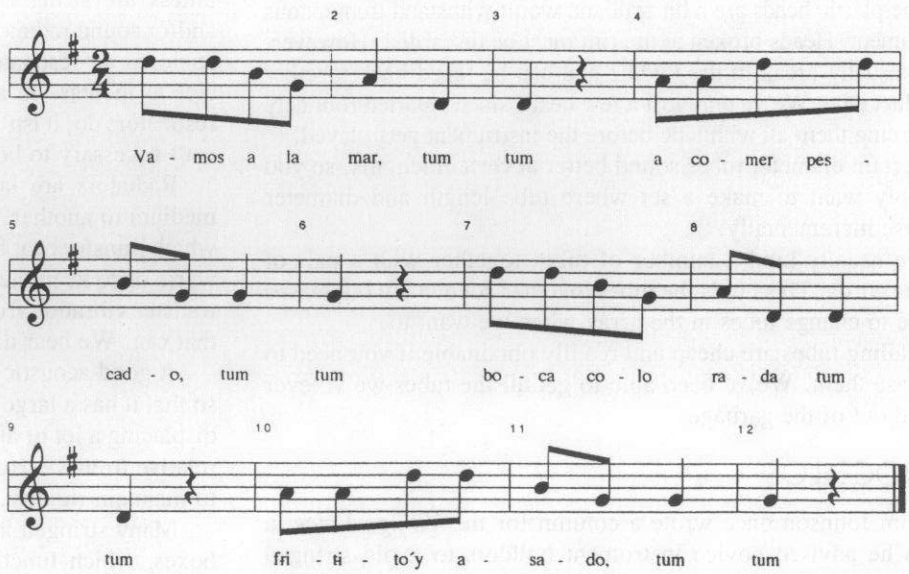
She would appreciate information about stories and legends of instruments, and ideas readers may have for simple instruments suitable for children to make and play.

Come and Join a March With Me



Vamos a la Mar



Vamos a la mar: let's go to the ocean. *A comer pescado: to eat fish. Boca colorado:* [the kind with the] red mouth. *Fritito y asado:* fried and barbecued. *tum tum: yum yum*

MAILING TUBE DRUMS AND STYROCELLOS
TWO REALLY SIMPLE INSTRUMENTS

By Skip La Plante

Over the years members of the group *Music for Homemade Instruments* have created a huge collection of instruments from trash, most of which are notable for sounding good, looking hideous, and using readily available materials in a very basic way. Several zillion years ago I wrote an article for *EMI* describing the kind of instruments in our collection. Since then we've added a number of instruments, a couple of which are distinguished by being really simple, cheap and musical.

MAILING TUBE DRUMS

One of the problems with building drums is that good drums use stretched heads, which means that the head must be attached firmly enough the body of the drum and with enough force so that it can remain stretched. This requires fairly strong drum bodies and a relatively elaborate means of attaching the drumhead.

I've been working with mailing tubes: cardboard tubes of various lengths, 4-10cm (2-6 inches) in diameter used to ship posters and the like. Remove the plastic cover from one end of the tube and make sure the tube is empty. Hit the other plastic cover and you get a moderately loud, clearly pitched thunk. The length of the tube determines the pitch, so you can use many tubes of different lengths together in order to assemble any scale you might want. The cardboard tubes are easily cut with a handsaw, and can be cut in a more controlled manner with a coping saw for fine tuning.

The plastic heads are a bit frail and won't withstand tremendous punishment. Heads broken at the rim must be discarded. However, heads usually break in the middle and can be taped back together with duct tape. We've only lost a few heads since I started routinely reinforcing them all with tape before the instrument gets played.

Certain diameter tubes sound better at certain lengths, so you probably want to make a set where tube length and diameter increase incrementally.

We usually bind a number of tubes together with a pair of bungee cords. This holds the tubes together adequately but leaves us free to change tubes in the array when we want to.

Mailing tubes are cheap and readily obtainable if you need to purchase them. We've been able to get all the tubes we've ever needed out of the garbage.

STYROCELLOS

Tom Johnson once wrote a column for the *Village Voice* in which he advised novice instrument builders to avoid stringed instruments because the sound of the instrument wouldn't be worth all the work involved. He wouldn't have written that if he'd known about the styrocello.

Rigidity is a key aspect of stringed instruments. A string attached between two points and then tightened will pull the points together unless the points are in some sort of a rigid matrix and can't move. I chose this roundabout description as I was thinking about long string arrays where one end of a wire might be attached to a building and the other end to a utility pole at some distance. The earth in between forms the rest of the rigid matrix. If the wire is attached firmly, the ends of the wire will not move.

Most string instruments have both ends of the wire attached to the same object. The simplest way to do this is to attach the string to either end of a strong, long, thin thing like a stick. There is a whole category of instruments like ektaras, gut bucket basses, etc. where the string is attached to a flexible extending element. Tension on the string can be adjusted by moving one end through space by manipulating the stick or frame stretching the string. Far more instruments attach some kind of a string to a big stiff thing that may warp a little under the initial string tension but afterwards holds it shape. In styrocellos the big stiff thing is a strong cardboard tube (the sort of tube around which bolts of cloth are wrapped), although anything else that qualifies as a big stiff thing would work adequately. On second thought, portability and ease of working the material are considerations. Cardboard tubes are lightweight and easily cut, drilled etc. It might take days to make a list of the big stiff things that don't share these properties.

An adequately stretched string doesn't make a loud noise unless the string's vibrations are transferred into a resonator and/or sound radiator. True resonators are chambers in which the enclosed air resonates, allowing the vibration of certain frequencies to increase in amplitude. It isn't simple to talk about what resonators do; it isn't simple to build a true resonator and it usually isn't necessary to bother.

Radiators are large surfaces that transfer energy from one medium to another. When I think of radiators I think of devices which transfer heat from metal to air in order to keep the bedroom warm or to keep the car engine from melting. Acoustic radiators transfer vibration from an item that can't displace much air to one that can. We hear displaced air.

A good acoustic radiator should be both stiff and lightweight so that it has a large surface area that moves easily when excited, displacing a lot of air. The thinner an item, the more surface area relative to mass. However, at some point items become too thin to maintain rigidity.

Many stringed instruments transmit vibration from strings to boxes, which function as both resonators and radiators. Other stringed instruments rely on sound boards, although *EMI* has seen plenty of print over the years about horns, steel sheets and other potential sound radiators. The term "sound board" implies wood,

historically the material of choice for resonators and sound boards. Two new-fangled materials stand out as potential replacements for wood. Both often come as prefabricated boxes, minimizing the fact that neither can be shaped as easily and precisely as wood. Corrugated cardboard boxes are a good combination of thin but adequately rigid surface area and little mass. Styrofoam boxes, often somewhat more rigid with less mass, make wonderful acoustic radiators.

Bridges transfer the vibration from the string into the resonator, soundboard or whatever. (In order not to have to say that again, I'm going to call them all resonators in the rest of this paragraph.) The less substantial the bridge, the less energy is needed to drive it and so the more energy imparted to the body of the resonator. Small bridges are good. The string pushes the bridge into the body of the resonator with a significant amount of force. The smaller the bridge, the more that force is directed at a very small portion of the resonator. If too much force is exerted the bridge pokes a hole right through its resonator surface. For this reason bridges are often shaped to be rather minimal except at the point of contact with the resonator. The most extreme case I know of is the bridge of a central Javanese rebab, which is a long (3 cm) thin (.5 cm) stick with a small flattened area at the top where the strings rest, and a very long (7 cm) thin (.5 cm over most of the length) foot. This distributes the strings force on the bridge widely across the resonator surface, which is thin animal skin. Styrocellos use styrofoam box resonators, which also can't withstand much pressure directed at a single point. I use a T-shaped bridge where the top of the T is quite thin but nearly as wide as the styrofoam box while the stem of the T is just a little wider than the string. I imagine that over the years students of violin acoustics have determined the optimal wood for bridges. Bridges made from pine slats about 1 cm thick that frequently show up in my local garbage seem to sound fine and cost nothing.

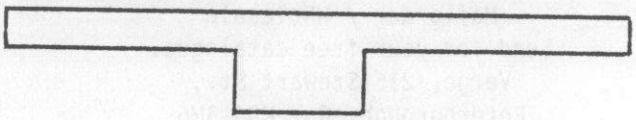
I've provided a little bit of theory so anyone who wants to try this instrument can use whatever materials they deem fit since, after all, only a small subset of *EMI* readers have access to my NYC trashscape.

Recipe

1 cardboard tube (the industry norm is about 1.6m or a little over 5 feet, the shortest tube on any of my instruments is .7m or a little over 2 feet). The thicker the paper on the tube, the better. Tubes with a flat seam running the length of the tube are likely to be more durable than tubes with a spiral seam.

1 styrofoam box without top. Other styroshapes work but not as well. The thinner the styrofoam walls the better.

1 T-shaped piece of wood. The vertical line in the T should be about 3-4 cm high. The horizontal line of the T should be 2-4 cm shorter than the surface of the box on which it will rest.



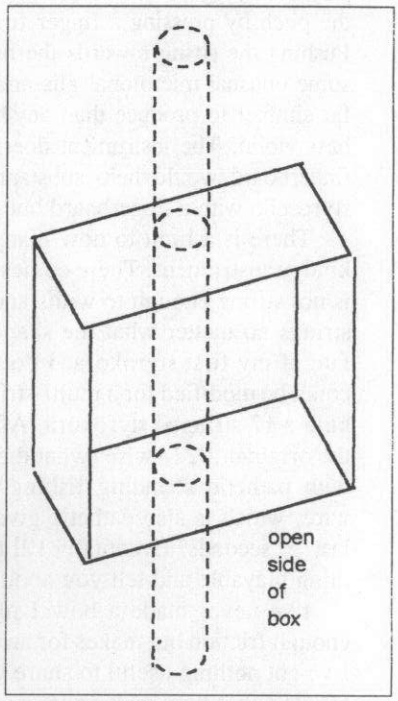
1 wire about 1.5 times as long as the cardboard tube. I found a huge roll of gauge 9 wire (.022") wire in the garbage years ago. I use it for everything and still haven't used it all up. I made one large instrument with really thick wire (.070" approximately) that plays in a strange and interesting way. I've been too lazy to change the .022" wire on my smallest instrument but thinner gauge wire would clearly make the instrument easier to play. There are no rules for what is the appropriate wire gauge — try everything.

1 turnbuckle, the smaller the better

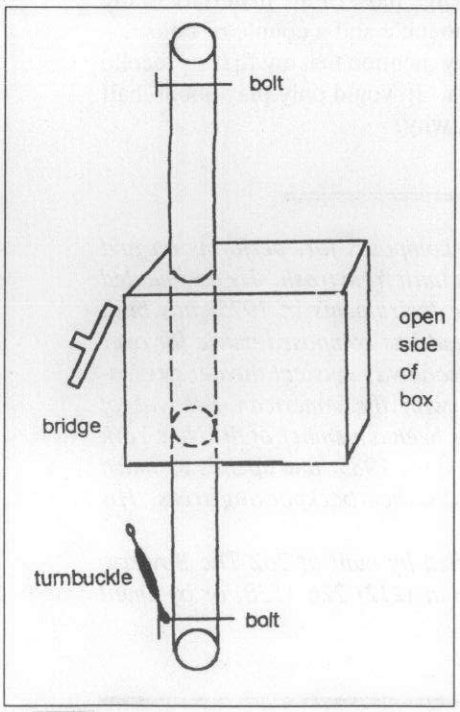
2 bolts (with nuts) about 2 cm longer than the diameter of the cardboard tube. One bolt has to be small enough to pass through an eye hole of the turnbuckle.

saw, pliers, knife, drill, magic marker

Cut cardboard tube to the desired length. Drill holes large enough for the bolts at both ends of the cardboard tube.



Stand styrofoam box on its side oriented so that the surface of the box that will be the top (or the bottom) of the instrument when it is played is on top. Put the tube open-end-down on the box. Place it in the middle of the box relative to the box's bottom surface, a centimeter or two in from the bottom edge, and trace the diameter of the tube onto the box (see diagram at right). Turn the box over and mark the bottom surface the same way. Use the knife to cut out the styrofoam circles, then insert the cardboard tube through the holes. The more snugly the tube fits into the holes the better. Rotate the tube so the drilled holes face the open side of the box.



Insert a bolt through an eye of the turnbuckle, then insert the bolt into and through the tube. Fasten it loosely with the nut, leaving enough space between the bolt head and the tube so that the turnbuckle can swing to a 30° - 40° angle from the tube. The turnbuckle needs to be positioned opposite the open side of the styrofoam box. Position the second bolt through the cardboard tube and fasten with the nut. There needs only to be enough space between the bolt head and the tube for the wire to wrap around the bolt (or leave extra space and tighten it later).

Attach one end of the wire to this bolt. Usually just making a loop and then

twisting the wire around itself several times is sufficient to hold the string firmly. Make sure the turnbuckle is spread to its maximum size. Pass the other end of the wire through the free eye hole of the turnbuckle and fasten it as tightly as possible. Position the bridge between the styrofoam and the string so that the string doesn't cut into the styrofoam box. You may have to move the box up or down the cardboard tube a little to protect it. Use the turnbuckle to tighten the string. Bake until your data is crisp. Serves all.

Without a fingerboard, the styrocello plays like a rebab, with the player varying the sounding length of the string and thus controlling the pitch by pressing a finger firmly against the string in mid-air. Pushing the string towards the neck raises the pitch, allowing for some unusual microtonal glissandi, as well as a wonderful vibrato far simpler to produce than anything I ever managed to do on the bass violin. The instrument doesn't play pizzicato at all well — a fingerboard would help substantially. I haven't tried to make a styrocello with a fingerboard but it should be possible.

There is a limit to how many strings one could put onto this kind of instrument. There comes a point where the styrofoam box is not strong enough to withstand the pressure of many tightened strings no matter what the shape of the bridge is. Such was the fate of my first styrokora. I do think the basic styrocello design could be modified for a multi-stringed instrument. So far I've only built a 17-stringed styrokora. After I replaced the box, I replaced the original .022" wire (what did you expect I was going to use?) with pathetic sounding fishing tackle strings, then with .008" wire, which is also pathetic given that each new string seems to last 20 seconds. Eventually I'll tweak this instrument into something playable and tell you about it.

I've never made a bow I like. Bicycle inner tubing creates enough friction but makes for an unbalanced mess of a bow. Ergo, I've got nothing useful to share with you. Maybe *EMI* can run an article about bow making later.

Ignoring all the things this instrument can't do (can't sort the wash, can't speak Urdu — this list could take months to compile) and ignoring the need for a suitable bow, you can make a pretty good stringed instrument for about $10 if you insist on buying all the components new. I can scavenge most of the materials so my cost is closer to $1.50 for a turnbuckle and a couple of bolts.

A final note: I should probably mention that my first styrocello went dead after about three years. It would only play about half as loud as it had. I have no idea why.

Skip La Plante invents, builds, composes for, performs on and teaches with musical instruments built from trash. He co-founded the group Music for Homemade Instruments in 1975, has built over 200 musical instruments, and has composed music for over 100 modern dance and off-off Broadway musical theater presentations. He appears regularly with the American Festival of Microtonal Music Ensemble, has been a member of the New York Indonesian Consulate Gamelan since 1985, and spends as much of his time as he can on long-distance backpacking treks. His favorite food is wild raspberries.

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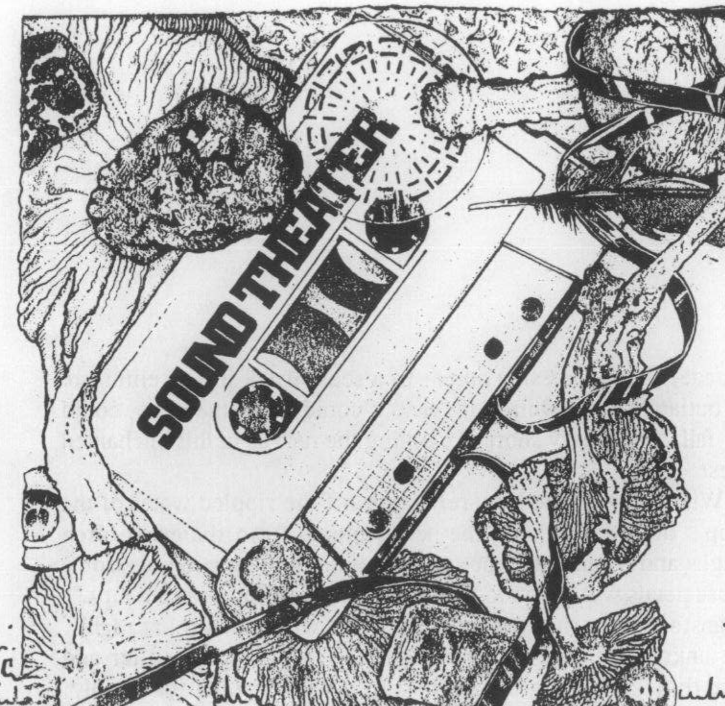


Circuit Bending and Living Instruments

The Swarblebox

A. R. Ghazala

Nature often reveals herself in the most beguiling of ways. Invisible energies might show themselves rendered by the aurora borealis, the sandy laces of tidal boundaries or the swirling patterns atop fields of windblown grass. Much more mysterious phenomena, quite outside scientific explanation, still unexpectedly spring forth to remind us just how limited our understandings truly are. What of square halos around the moon? How about non-ecliptic shadow banding traveling across the earth? Or the brilliant "kaleidoscopic suns", an occurrence of multi-colored solar distortions reported throughout history from around the world and occasionally attributed to divine oracle?

What would happen, then, if we inject into this capricious atmosphere an experimental musical instrument that is not only designed to be sensitive to fluctuations within this constantly changing realm, but in fact derives its very power to operate from the swaying currents of energy within this turbulent ocean of air?...

Q.R. Ghazala: 7-90

THE SOLAR BUG BOX

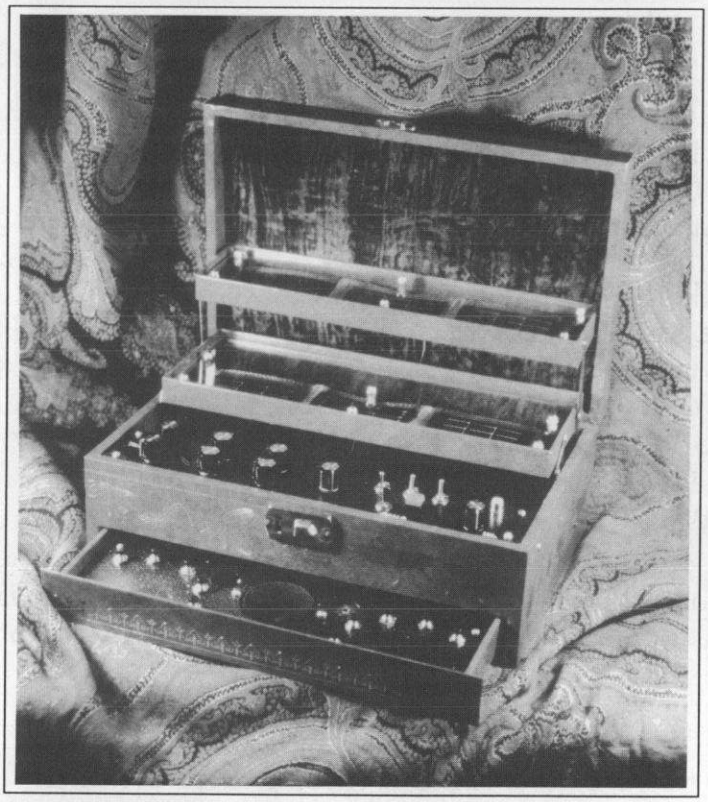
By Q R Ghazala

(continued from previous page)

On this cold spring dawn, with winter's last rising veils evaporating into the clear sky above, I sat close to the small fire and listened to the woodland's ritual song; an inspired morning chorus of welcome as it has always sounded to these ears. Certainly an insect never before met must be responsible for the varied buzzing behind the dogwood blossoms at the edge of camp, petals now sailing in the low yellow rays of light cutting past the gray-blue smoke that twisted straight upward through the calm of early day.

From along the lake and river shores of the area, from the trailside, roadside, campsites and town dump I had collected the makings of initial camp amenities. This day was set aside to build a sundial, hanging candle lanterns, mobiles, a weathervane and perhaps a musical instrument while taking in the new sights and sounds of the clearing around the tents.

A bit later, the insect behind the dogwood tree's white blooms, swaying now in noontime breezes, had begun chirping in irregular rhythms, only on occasion slipping back toward its previous drone. I imagined it to be a cricket of some type, warming in the more direct rays of sunshine. The voice had become stronger, with precise descending trills at the end of each rising call. I began to picture a larger insect, bringing back memories of the big pine sawyer beetles that had succeeded in gnawing holes through the canvas of the music tent the previous year. It took a powdering of cayenne pepper on the canvas, the multi-purpose magic dust that it is, to discourage these uninvited diners.



Large Solar Bug Box, as detailed in this article.

It's interesting to note that, while pine sawyers don't chirp, we are indebted to them for creating one of the most startling and perhaps surreal insect-produced noises around. In the still of a heavily infested stand of woods, the sound of these tunneling insects, burrowing en masse within the trees, resonates audibly through the wood and results in the listener feeling surrounded by some invisible force hanging in the air amidst the trunks and branches. After all, trees themselves, at least the half-dignified ones of most people's acquaintance, simply don't stand around humming and gurgling to themselves. As you'll imagine, unless the unlikely connection with hidden insects is made, finally pressing an ear to a scaly trunk just to eliminate the outlandish possibility of "It... it couldn't be the trees, could it?" falls alarmingly short of calming the nerves in this enchanted forest.

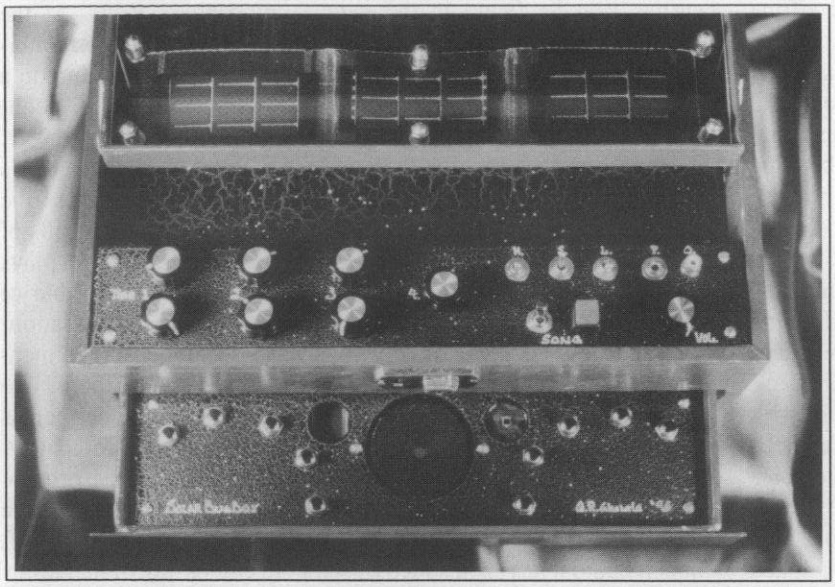
With the sun now low, reflecting off the rippled water of the camp's little bay, I hung the new lanterns from fluttering birch boughs and listened for the insect behind the dogwood blossoms whose petals were soon to be turned into luminous moth lamps... a transformation that is becoming to all white flowers at night. The unknown insect sang out less and less, its song softer and more timid, sounding for the first time as if waiting for a reply, and soon not sounding at all.

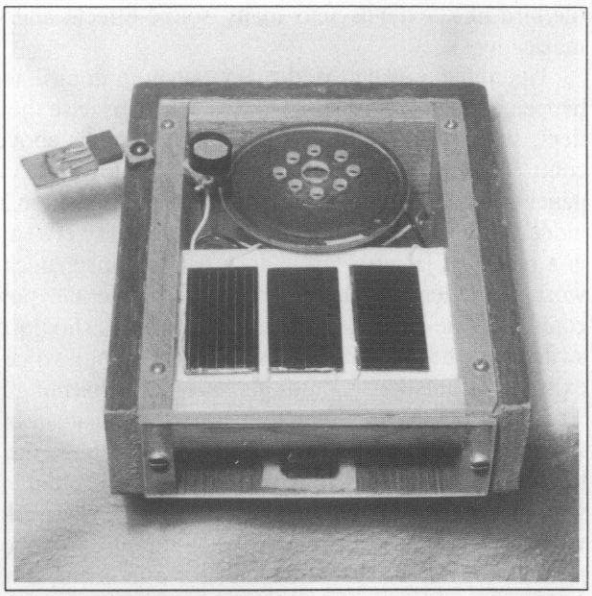
Later, in the dark, when my fire leapt tall and bright, I did hear the voice again. Here it finally revealed its connection to light as it buzzed, chirped and sang in unison with the conducting batons of flame. Quite idyllic, really.

And now I must reveal that this unknown insect sound, the background to all my day's activities, was in fact, an experimental sound instrument of my own design: a light-powered and light-modulated synthesizer, which I had placed at camp's edge so I could audibly interpret the changing light of passing day. An early version of the device that I call the Solar Bug Box, it had at its heart a very basic "tone burst" generator whose pitch-sweep frequencies and timing are based upon rudimentary resistor/capacitor (r/c) combinations.

Both 555 and LM3909 ICs (timer and LED flasher/oscillator, respectively) are often used as tone burst generators. Seeing as the LM3909 requires only a 1.5 volt DC supply and can directly drive a speaker (let alone a line output), it clearly lends itself to solar-powered designs. Three solar cells, which regardless of size are commonly rated at .5 volt output each, when wired in series will provide the needed 1.5 volts.

The seeming complexity of the final Bug Box designs it truly deceiving. As noted before, tone burst generators look to r/c pairs for their operation. The resistors govern the charge/discharge rate of the capacitors. This results in a voltage release from the

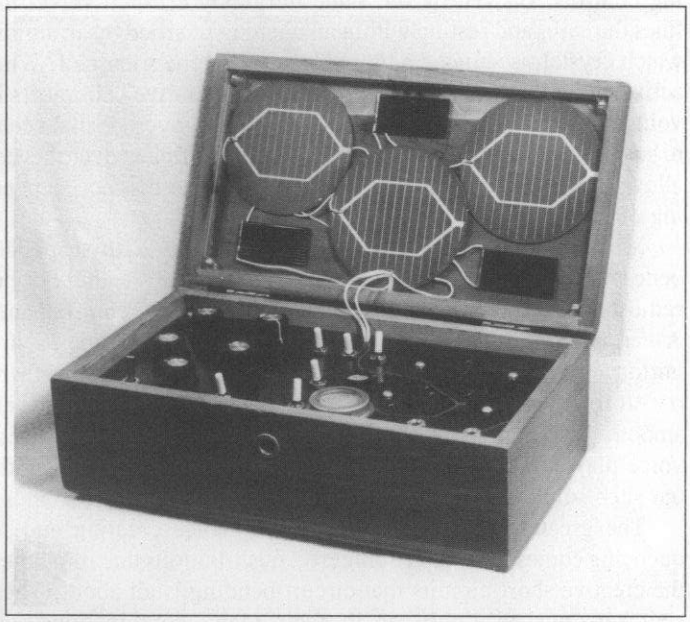




Above left: Large Solar Bug Box controls.

Above right: An early Solar Bug Box, the "Solar Cricket." Desigend to simulate one realistic call only.

Below: Small Solar Bug Box.



capacitors (or series of releases) that translate directly into audio bursts. If the values of these r/c combinations are changed, so are the pitches and timings of the voices produced. Accordingly, a single r/c pair could grow into two panel-mounted controls: the resistor becomes a wide-ranging potentiometer (variable resistor) or multi-position rotary switch with which to choose any of a group of differing resistors, and the capacitor becomes another rotary switch then wired to choose from a group of differing capacitors to be used in conjunction with the chosen resistance.

All Solar Bug Boxes center around several such tone burst generators arranged to discharge in sequence so as to provide multi-step voices. Each generator uses extended r/c combinations as described. Looking at the upper control panel of the large Solar Bug Box (see photo), all 7 dials from left to center represent just such controls. The rest of this panel is dedicated to the expected audio extensions: headphone and line outputs, volume control, monitor speaker switch, looping and one-shot trigger switches and a couple on/off switches wired to sensors on the lower control panel... which is where the story changes.

Up until now, everything discussed about the Solar Bug Box has been based upon theory-true design, and brings us to our precarious perch above our usual Sea of Chaos, walking us to the edge of the circuit-bending* plank.

Other than the central monitor horn (2" piezo midrange/tweeter), every device/control/sensor on the lower panel was resultant of circuit-bending. Just as it is with any circuit-bending project, pure chance connections were begun between different sections of the normally operating circuit. This process succeeds in sending signals of types quite outside expected theory-true design logic into sensitive circuit areas, disrupting the order of what everyone had previously worked so terribly hard to create. Nonetheless, it is this circuit-bending panel that provides the most intimate interface with the instrument, in addition to accessing the unusual voice variations common to circuit-bending's anti-theory aesthetic.

Discovered in this way were attachment points for two environmental sensors (one for humidity and one for light) as well as 10 direct voice-bending circuits (simple one-wire connections between various circuit points), now actuated by means of the 10 fingertip-located push buttons.

Powering all this circuitry are 2 banks of solar cells capable of turning light, ranging from sunlight to candlelight, into usable electrical energy. Each bank outputs 1.5 V in overhead sunlight. Both are wired together in parallel. This voltage source is applied to the circuit by means of the 2 song switches: momentary push-button for triggering the voices on cue, and toggle switch for constant (looping) signal.

Playing the Solar Bug Box involves two separate techniques, or perhaps better said, two separate musicians. The first one might be you, or anyone else perhaps interested in abstract bug squeaks. (Actually, the range of sounds, while mostly bug/rep-

"Circuit-bending" refers to the process of creative short-circuiting by which standard audio electronics are radically modified to produce unique experimental instruments. A further description of these techniques can be read in *EMI* Volume VIII #1, Sept 1992.

tile/bird-like, extends into many sound-effects and odd riffing musicalities).

Upon the raising of the lid, several things automatically happen at once. On scissors-like mechanisms rise the 2 solar cell tiers, settling in at different heights and depths above the upper control panel. While this transpires, the lower circuit-bending panel slowly extends outwards from its prior position having been hidden within the main housing in a closed drawer. This enclosure is a modified jewelry box whose original mechanics are still at work here, lending themselves superbly to the powering and control of the new instrument. Best of all, should the looping switch have been left turned on, a repeating bug voice swells into existence as the housing unfolds itself ...a charming little effect.

Sitting before the Solar Bug Box, the musician is faced with 25 controls. My standard approach would be to use the 7 r/c knobs to create an insect song to work with. While listening to the voice with the looping switch turned on, adjusting the r/c knobs alters voice segments in ways such as when vibrato occurs or how long pitch sweeps might last. Imagine, for a moment, a high-pitched trill leading into an abrupt pitch drop immediately followed by a slow rise and ending in a momentarily sustained note that then jumps up out of hearing range. The 7 r/c controls can arrange, delete, time-and pitch-shift such voice elements.

Once this voice sequence is set, it then can be modulated in a great number of ways by means of the lower panel's circuit-bending controls. Backed by the same burgundy crushed velvet that lines the case, and resting within an opening guarded by an antique watch crystal, is situated a tiny (1/4"x1/4") blue solar cell. When activated by its upper panel switch, this diminutive cell injects its voltage into a circuit area (one of several discovered) that seems to strengthen the voice in progress. Waving a finger over this cell allows a nice expression control, from subtle to distinct, depending on the voice present.

Meant to soar in the ethers high above the earth suspended beneath a balloon, a humidity sensor from a U. S. Weather Service radiosonde rests below another opening in the lower control panel. A variable resistor, the oblong slate-gray device can be used to uniformly alter voices in accordance with the day's atmospheric moisture by simply leaving it turned on. Additionally, a very smooth pitch-bend is possible by breathing on the sensor during voice play. The effects of this control are usually rather subtle, but such subtleties add much life to suggestive abstract sounds.

The greatest degree of control over voice creation and sequencing comes from the 10 fingertip push-buttons that implement the creative short-circuits that circuit-bending is all about. These switches, pushed singly or in their many combinations, can outrageously transform the voice present, turning it now into a completely different sound and pattern. Altering these switching combinations in tempo with the insect calls will further extend the effect of believable vocalities, initiating very complex song cycles.

Because solar cells alter their voltage output very quickly as light levels change, additional voice shaping can be had by waving a hand over the 2 cell banks. Differing light sources --tungsten, fluorescent, UV, video monitor, color filter wheels, strobes, various vapor lamps, etc.-- will also sculpt the final sounds. With all the assorted controlling factors working together, the final result is that of seemingly endless voice patterns to discover, all centering around abstract calls of imaginary small animals.

The other playing technique, or musician as I suggested earlier, can be found in the natural atmosphere itself. At the morning campsite mentioned at the offset, only non-direct ambient light fell upon the small Solar Bug Box's cells, resulting in a quiet buzzing. Later in the day, the dappled light of noon, fluctuating now through moving leaves, brought out the stronger, changing voices. Finally, low reflected light from the water's surface, only occasionally sending an orange beam across the cell's crystalline surfaces, brought about the intermittent calls of late day. Ultimately, sitting at the controls while natural light plays upon the solar cells presents a tantalizing interface capable of producing a guided voice still sparkling with chance punctuation.

Finishing elements involved several techniques. As mentioned, burgundy crushed velvet covers the inside of the instrument's case and also lines the solar cell tiers. The steel panels themselves are katydid-green with a black crackle overcoat. A sprinkling of iridescent dust was then lacquered over these organic textures and hand-inked control titles, serving as a final protective gloss. The original deep red parchment outer covering was left intact, but to it has been added raised gold embossing of numerous insect images. This is done with a very nice rubber stamping technique wherein a metallic powder (embossing powder) adhering to the stamped figure is heated, raising and hardening the powder into a fine detailed image. A 5-inch golden dragonfly is centered on the lid while a dozen or so glittering smaller insects creep along the sides.

While I haven't been fortunate enough to witness a kaleidoscopic sun or its effect upon a Solar Bug Box, the influence of the passing of a normal day upon the instrument can be fascinating in itself. I have, however, noticed many mysterious fluctuations of unknown origin while playing light- or atmosphere-sensitive instruments in the out-of-doors. Very intriguing.

The plans are not yet solid, but based upon such devices as the Solar Bug Box I'm slowly dreaming up a polyphonic, atmosphere-powered/played instrument that might sense plants flexing, creature movements, wind, light/shadow changes, humidity, temperature, barometric pressure, water currents, natural radio propagation, cosmic particles and the like. Seeing as electronic sensors that respond to all of these phenomena are readily available, both new and at bargain prices in surplus, many such possibilities exist for environmental control of sound synthesis.

It does occur to me, in the midst of all this, that listening to trees is still commercial-free. And should the truth be told, I'll admit that when I discover two trees standing a cranium apart I often find myself thinking "...headphones?"

Pardon me, I drifted.

Contact Reed Ghazala at The Anti-Theory Workshop, c/o Sound Theater, 3325 South Woodmont Ave., Cincinnati, OH 45213, USA; email qrg@anti-thoery.com.

Reed's full-color *Anti-Theory Workshop* catalog is now available. A visual treat itself, the 8-panel brochure depicts 19 different instruments and three of Reed's recent music packages. To receive a copy send $1 and a self-addressed envelope to the workshop address above. For more information, see his notice in this issue's Notices column.

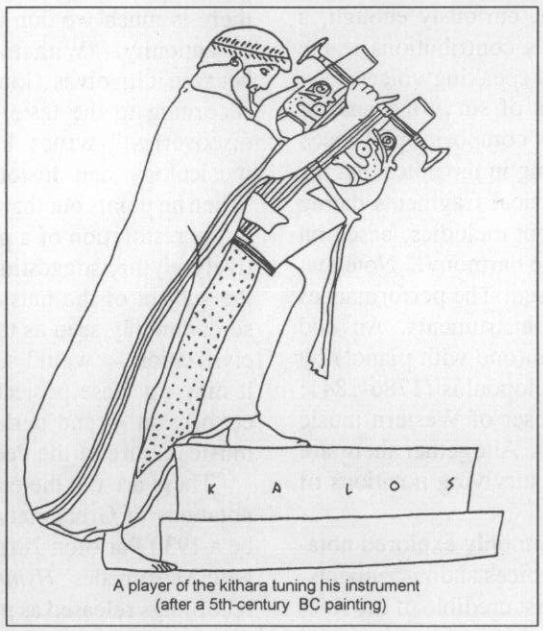
SOUNDING ANTIQUITY

Reconstructions of Ancient Greek Music

By Mitchell Clark

The reconstruction for performance of the music of antiquity is a subject that is being increasingly addressed in the West, where a number of recent projects have been documented in recordings. This is especially true of Greece, which is the ancient music culture of the Western world with the most extensive musical documentation. Our focus here will be on musical reconstructions of surviving notations from ancient Greece — with a look at the reconstructions of instruments — as reflected in five recent recordings.

As John Blacking pointed out, *historical musicology* is concerned with cultural traditions which had some system of musical notation, whereas *music archaeology* is faced with reconstruction based on artifacts.[1] The reconstruction of music of ancient Greece is a combination of both, in that both sides are called into play. In the musical treatments found in the recordings to be discussed here, historical musicology and music archaeology will be seen to ebb and flow (tugged by greater or lesser degrees by the tidal pull of, as it were, the sun and moon of creativity) as the musicians try to make sense of the inheritance of ancient Greek notations.



A player of the kithara tuning his instrument (after a 5th-century BC painting)

The musical notations which survive from Greek antiquity form a corpus of some 50 items which covers some eight centuries or so, a period ranging from roughly the fifth century BC through the third century AD.[2] Surviving notations are in almost every case fragmentary, and in some instances may be so mutilated that it is hard to form an idea of the original upon which a musical performance is to be based. As we shall see, several different approaches may be taken to making sounding objects out of these fragmentary notations.

The instrumentarium of classical Greece was quite large, with a wide variety of stringed, wind, and percussion instruments, many of them inherited from West Asia (but often given Greek origin myths). The most celebrated and important of the instruments of ancient Greece are various types of lyre, which were used throughout early Greek history. In addition among stringed instruments, harps and lutes were in use, as well as zithers, although zithers were used in a very limited capacity, and probably only for the demonstration of tonal intervals. The reed-pipe *aulos* is also of great importance, almost rivaling the lyre. Additional wind instruments include the *syrinx* panpipes, flutes, *hydraulis* organ, and bagpipes. Lip-vibrated aerophones, used for signaling, included bronze trumpets (*salpinx*) and their less-esteemed cousins, animal horns and conch-shell trumpets. Percussion instruments had a rhythmic role and included drums, cymbals, clappers, and rattles. Pitched idiophones — such as sequences of tuned discs — appear to have been occasionally used, but basically, like zithers, for demonstrating intervals.

Of the five albums of music of ancient Greece under consideration here, the earliest is *Musique de la Grèce Antique* by the Atrium Musicae de Madrid, directed by Gregorio Paniagua, originally released as an LP in 1979 (due to the similarity of the titles of these albums, this one will be referred to hereafter as *Atrium;* see the discography overleaf). From the early 1990s (?) are two releases of Greek ensembles: Petros Tabouris' *Music of Greek Antiquity* (hereafter *Tabouris*) and Christodoulos Halaris' *Music of Ancient Greece* (hereafter *Halaris*). A recent American contribution is De Organographia's *Music of the Ancient Greeks* (hereafter *Organographia*). The most recent is *Musiques de l'Antiquité Grecque* (hereafter *Kérylos*), a French recording performed by Ensemble Kérylos under the direction of a scholar of ancient Greek music, Annie Bélis.

Atrium contains the bulk of the existing notations as they were generally known to scholarship in the 1970s. For better or for worse, it also contains some of the spurious pieces of "Greek Antiquity" which have popped up over the centuries, most notably those which Athanasius Kircher published in the 17th century, claiming to have found them in manuscripts which have otherwise become lost.[3] Gregorio Paniagua himself adds a brief prelude (*Anakrousis*; track 1[a]) and postlude (*Epilogos-Katastrophe*; track 22[b]). As an interesting bonus, the unique surviving musical document of ancient Rome, a fragment from Terence — a neumatic notation

DISCOGRAPHY

ATRIUM
Atrium Musicae de Madrid (Gregorio Paniagua, director), *Musique de la Grèce Antique*. Harmonia Mundi France HMA 1901015 (1979; CD reissue, 1986). Notes in French, English, and German. Available in record stores.

HALARIS
Christodoulos Halaris, with ensemble and vocal group, *Music of Ancient Greece*. Orata ORANGM 2013 (n.d.). Notes in Greek, English, and French. American distribution by Allegro Imports.

KÉRYLOS
Ensemble Kérylos (Annie Bélis, director), *Musiques de l'Antiquité Grecque*. K617 K617069 (1996). Notes in French and English. French distribution by Media 7.

ORGANOGRAPHIA
De Organographia, *Music of the Ancient Greeks*. Pandourion PRCD1001 (1995). Notes in English. Available from Pandourion Records, 709 Fifth Place, Oregon City, OR 97045.

TABOURIS
Petros Tabouris, with Aulites ensemble and vocal group, *Music of Greek Antiquity*. Paian 653 (n.d.). Notes in Greek and English. Distribution in Greece by F.M. Records S.A., 7 Knossou str., 111 46 Athens. This album is a single-CD selection taken from two 2-CD sets by Tabouris on Paian: *Secular Music of Greek Antiquity* (Paian 606) and *Sacred Music of Greek Antiquity* (Paian 607), and so is broken down into two sections, "Secular Music of Greek Antiquity" (tracks 1-14) and "Sacred Music of Greek Antiquity" (tracks 15-27).

for a single line (861) from *Hecyra* — is also included.[4] The Atrium Musicae de Madrid performances include a wide variety of instruments (sixty are listed, including, curiously enough, a *sirène de Helmholtz* — used in Paniagua's contributions at the beginning and end), and many singing and speaking voices.

Tabouris contains a few performances of surviving ancient Greek notations, but is largely made up of "composition[s] based on ancient Greek musical system[s]," stating in the notes that the "parts of the collection which are not musical fragments dating from antiquity are reconstructions of ancient melodies, based on the prosody of the verse and the appropriate harmony." Note that such "ancient melodies" are newly composed. The performances feature singing voices and a variety of instruments. An odd inclusion is choral settings of ancient texts (one with piano!) by the 19th-century Greek composer K. Nikolopoulos (1786-1841; as the notes say, "the oldest Greek composer of Western music who composed music on ancient texts..."). Altogether there are ten selections (out of 27) based on actual surviving notations of ancient Greece.[5]

Halaris contains many of the more commonly explored notations in thickly textured arrangements for voices and instruments. On a number of levels, this album is the least credible of the five, especially from the standpoint of its musical reconstructions and in regards to the instruments used.[6]

Organographia draws from a large number of notations — more than any of the other albums for a total of 24 selections — presented in small-ensemble performances featuring a single voice and a variety of instruments.

The fifteen selections on *Kérylos* are the "standards." Voices, solo and in ensemble unison, are in the forefront of the recordings; only a few instruments are used.

As sources of information on instruments of Greek antiquity, the usefulness of the albums varies widely. The three which give some solid information — *Atrium*, *Organigraphia*, and *Kérylos* — include some amount of photographs and documentation. Note that this refers to *Atrium* in its original LP version, which included an insert with photographs of some of the principle reconstructed instruments — such as lyres, *aulos*, *plagiaulos*, and some percussion instruments — used in the recordings. Unfortunately, in its CD incarnation, *Atrium* simply lists the instruments. *Organigraphia* names the instruments used in each selection and includes a color photograph of the reconstructed instruments used for the performances. As mentioned above, *Kérylos* uses few instruments; they are described in the notes, and in booklet photographs the *kithara* and *tympanon* are shown in the hands of the players. There's no information in *Tabouris* or *Halaris* about the instruments upon which the music is performed, and in *Halaris* the instruments used for the recordings appear to be unrelated to any actual instruments of Greek antiquity. With *Kérylos* including few instruments and with *Tabouris* and *Halaris* being at best of questionable value, we find that *Atrium* (again, in its LP version) and *Organigraphia* are the most useful, overall, for an examination of reconstructed instruments of Greek antiquity, in both performance and in documentation.

If anyone were to feel that what survives of the ancient Greek notations were to be the only workable material for reconstructed performance, there would not be a lot to go on. Some amount of reconstruction in the music is necessary. Each of the recording projects here is as much a portrait of the ensemble as of the music; each ensemble takes what it needs from the notations to create its own musical work.

Questions of authenticity in these reconstructed performances have to be addressed with a certain amount of openness, because there is much we don't know concerning performance practices of antiquity. "With music, authenticity is ... a utopian ideal, because it involves a kind of conjectural restoration which changes according to the taste of the times and the latest encyclopedic discoveries," writes Pierre Boulez in a critique of historical musicology and historically informed performance practices. When he points out that "every search for authenticity is dedicated to the restoration of a past which today we conceive as comparatively idyllic, suggesting a golden age that never really existed," the subject of the music of the Greece of antiquity — the epoch so commonly seen as the golden age and wellspring of European civilization — would seem especially to be invoked.[7] Be that as it may, in these projects attempts are being made to establish a connection — and perhaps to re-establish a continuity — with a music culture of the deep past.

These are not the earliest of recordings of performances from notations of Greek antiquity — the earliest such recordings may be a 1930 Parlofon 78rpm release of the *Song of Seikilos* together with Mesomedes' *Hymn to the Sun*.[8] There also have been a few recordings released as musical examples for music history books.[9] The tuneful *Song of Seikilos* had a popular history in Western Europe even before recording technology: in 19th-century England it was sometimes sung as a grace before dinner.[10] The majority of the extant notations of ancient Greek music have only become known in the 20th century, and some have only been published to the scholarly community in the last decade or two — a few of the notations available to *Organigraphia*, for instance, were not available to *Atrium*.

In the artists' statements accompanying these recordings, there can be found quite a variety to the approaches to reconstruction

and performance of the Greek notations. *Atrium* takes a fairly philosophical approach to the issues of survival and loss as regards the original notations and surviving information on performance practice. On the other hand, we find in *Kérylos* that Annie Bélis begins her notes with the statement that the fifteen pieces on the album "shall be heard today exactly as they were performed when they were written." This is a bold and suspicious claim for a scholar to make in the first place, and we find things are on shaky ground when what appears to be a modern trumpet plays the fanfare — from circa 500 B.C. — which opens the album. (*Organigraphia* opens with this fanfare played on a reconstructed *salpinx*.) This is followed on *Kérylos* with a vocal performance by a singer who sounds as if she's straight out of modern conservatory training, singing with a style of vocal production more suited to recent Western art song than to, we should suppose, the meaningful recreation of music of antiquity.

There are several cases where the instruments used are anachronistic to the time of the notations. These most clearly show up on *Tabouris* and *Halaris*, where wire-strung instruments — even a relatively late wire-strung instrument such as a hammered dulcimer — are commonly found. It sounds like there may also be wire-strung instruments on *Atrium*. The technique of wire drawing for musical strings did not really come into use until about 1300 A.D.[11] The use of what clearly sounds like a modern trumpet on *Kérylos* has already been mentioned. There may well be finer points of anachronistic use of instruments which will be noticeable only to specialists.

As mentioned above, the most important instrument of Greek antiquity was the lyre, in its variant forms and with seven as the classically prescribed number of strings. It is understood from classical texts and paintings (and all but confirmed by modern research) that the classical technique of playing the lyre included — in addition to simply plucking single strings — a special technique of striking all the strings at once in a sweeping motion. In this technique, those strings which were not to sound pitches were dampened by fingers of the player's left hand, while the strings which were to sound were not dampened. All the strings were then brushed by a *plektron* held by the right hand. This technique (which is related to that used in the modern autoharp) is found in the playing styles of lyre traditions which survive to the present day in areas which inherited the small bowl lyre from ancient Greece.[12] Examples of this small lyre include the Yemenite *tanbura* and the Ethiopian *krar*.[13]

With this technique understood to have been an important part of how the lyre was played in antiquity, it is surprising that this playing style is barely explored on the recordings under consideration. On *Atrium*, in Mesomedes' *Hymn to the Sun* (track 6), this lyre technique is interpreted in an unusual way. In addition to lyres of various kinds (*kithara*, *barbitos*, *phorminx*) played (it would appear) in this fashion, the chorus renders the song's text in the original notated rhythm but spoken in a flat monotone — as if to imitate the many strings of the lyre deadened by the player's left hand. Even if there were looming questions about this strummed style of lyre-playing in ancient Greece, it would seem that a recording such as one of these would be the perfect place for exploration, where attempts at reconstructing practical music-making are often hypothetical by necessity.

Clearly, what *Atrium* is doing in this example is not a traditional technique — or at least a known one. But the effect is very interesting. There is the question as to whether the music of the projects discussed here is evocative of antiquity, if at times lacking in historical accuracy. Such an evocation seems a relevant approach. "Historical Performance" (although the term in some ways may be something of an oxymoron) is more than just playing surviving old instruments or their modern reconstructions. It should be at one and the same time a discipline and a creative endeavor.

In *Atrium*, a number of approaches have been taken to the issue of reconstruction: lacunae created by the fragmentary state of the material may be treated as silences, filled in with some speculative form of reconstruction, or by discordant noises unrelated to the original. The results are unorthodox — especially in the case of the use of noise. But these results are often very compelling and do evoke a sense of the archaic past, and the accomplishments of *Atrium* are, perhaps, best gauged by their evocative and dramatic qualities. And *Atrium* is indeed dramatic — it's almost as if the various notations have been pieced together to become the "book" for a piece of ritual theater. The *Atrium* album, as a program, has a fascinating dramatic continuity from beginning to end, and its qualities of *antique* and *modern* fuse effectively. In addition to being considered as a reconstruction (or amalgam of reconstructions), *Atrium* could be thought of as a "sounding of the documents," and in this sense it is the most interesting of the approaches, bearing a relation to recent attempts to make sounding (and sound) sense out of the few musical documents, dating to around 1913, by Marcel Duchamp.[14] Atrium has garnered its share of adverse press for issues relating to the authenticity of its treatments.[15] Its unorthodox approach is acknowledged. But next to it, work like *Kérylos* is at times dry, even timid.[16]

In this field of the recreation of ancient Greek music, five CD releases is a great deal of activity. But it seems like a beginning to the exploration. More approaches to the music are welcome, because for one thing — despite the claim made in the notes of *Kérylos* — there can never be a definitive version.

NOTES

1. John Blacking, "Ethnomusicology and prehistoric music-making" in Ellen Hickmann and David W. Hughes, eds., *The Archaeology of Early Music Cultures* (Bonn: Verlag für systematische Musikwissenschaft GmhH, 1988): 329-335, at 329.

2. The earliest of these is a painted image of a trumpet player accompanied by the syllables TOTÊ TOTOTE, which preserves the trumpet call in a sort of "sol-fa" form (*Kérylos*, track 1; *Organigraphia*, 1; see Discography on previous page). The latest is a Christian hymn, which has the double distinction of being the latest piece of ancient Greek music and the earliest Christian hymn (*Atrium*, track 16; *Halaris*, 13; *Kérylos*, 15; *Organigraphia*, 17). For a detailed listing of these documents, see M.L. West, *Ancient Greek Music* (Oxford University Press, 1992), Chapter 10, "The Musical Documents," divided into a catalogue (pages 277-283) and transcriptions of selected notations (283-326). Egert Pöhlmann, *Denkmäler Altgriechischer Musik* (Nürnberg: Verlag Hans Carl, 1970; text in German), includes transcriptions and facsimiles of the notations, including the spurious ones, that were available at the time of its publication.

3. Cf. West, *Ancient Greek Music*, 7, note 11. *Atrium*'s selection is based on the contents of Pöhlmann's *Denkmäler Altgriechischer Musik*.

4. In performance here by the Atrium Musicae, this item is only twenty-four seconds long (track 19); cf. Pöhlmann, *Denkmäler Altgriechischer Musik*, no.13.

5. I have not been able to determine the source for track 18, *"Agios o theos"* (quotes theirs). In the newly composed selections, present-day Greek and West Asian traditional musical styles appear to figure into the interpretations.

6. Note that Warren D. Anderson, *Music and Musicians in Ancient Greece* (Ithaca & London: Cornell University Press, 1994), 239, warns that this

recording should be "strictly avoided." Admittedly, I include it here, as does Anderson in his discography, for the sake of completeness. *Halaris* is indeed extremely quirky and anachronistic in its instrumentations — to say nothing of inaccuracies in its interpretation of the notations — but it is at times, with its unusual choral treatments and use of low-pitched flutes, spookily evocative.

7. Pierre Boulez, trans. Susan Bradshaw, "The Vestal Virgin and the Fire-stealer: memory, creation and authenticity" in *Early Music* 18/3 (August 1990): 355-58, at 356.

8. As mentioned in the liner notes of Tabouris' *Music of Greek Antiquity*, 38.

9. See the discography of Anderson, *Music and Musicians in Ancient Greece*, 239-240.

10. Anderson, *Music and Musicians in Ancient Greece*, 226.

11. And of course there's the Nikolopoulos setting for chorus and piano also found on *Tabouris* (track 27).

12. The larger West Asian box lyre did not have a history in Greece, and survives today only in the Ethiopian *bägänna*.

13. There are a few recordings of these instruments, and on them this strumming technique can be clearly heard. Perhaps the most stunning is the Yemenite *tanbura* performance to be heard on *Yemen: Traditional Music of the North* (Auvidis-UNESCO D 8004). *Ethiopia: Three Chordophone Traditions* (Auvidis-UNESCO D 8074) includes *krar* performances (as well as recordings of *bägänna*). See also Cajsa S. Lund's *Fornnordiska klanger — The Sounds of Prehistoric Scandinavia* (Musica Sveciae MSCD 101) for a Viking-Age Scandinavian lyre made and played by Graeme Lawson.

14. See, as an example, S.E.M. Ensemble/Petr Kotik/John Cage, *Music by Marcel Duchamp* (Edition Block/Paula Cooper EB 202 [1991]), which includes realizations of Duchamp's *Erratum Musical*, *Sculpture Musicale*, and *La Mariée mise à nu par ses célibataires même*.

15. See, for instance, Bo Lawergren's review in *Ethnomusicology* 29/2 (Spring/Summer 1985): 360-363.

16. It should be mentioned that there are treatments in *Kérylos* which seem almost to emulate approaches in *Atrium*, perhaps most notably on the *Song of Seikilos*.

SCRATCHING THE SURFACE: THE BALLOON IN MY LIFE

by Ricardo Arias
with drawings by Naomi Culla

PREAMBLE

This article is an account of my personal experience with rubber balloons as musical instruments, of how I've come to make Inflatable Music. I will also make reference to works by other musicians who have used these latex bladders, and will talk a little bit about somewhat more ethereal questions hoping to give a context to the story.

Ever since I started playing and studying music my interests have bent strongly towards the use of "informal" sounds or "noises," the complexity of which I first discovered while working in an electronic music studio. Along with this there has been an instinctive mistrust of conventional musical practices, which has led to avoiding the use of instruments and compositional methods stemming from the European tradition in which I was being schooled, both as a flutist and a composer. I made music by sounding/playing everyday objects so that I would deflect people's attention from the usual expectations — i.e. instrumental acrobatics, compositional "genius", etc. — to the very sounds being conveyed. Nothing new, of course, but it did serve to confirm that there is what artist George Brecht has called a "virtuosity of the spirit," not readily apparent, but essential in transforming even the most mundane of activities into something somehow meaningful. Also, as a Colombian I didn't feel at ease playing classical European music, jazz, or even Afro-Caribbean music, for that matter. It can be said that I opted for a *non-tradition*, for Ashley's "music with roots in the aether" — the group Sol Sonoro, of which I will speak later, was at first symptomatically named Tradición Simultánea (*Simultaneous Tradition*). So it is, in looking back, that my *modus operandi* wound up consisting of four main strategies:

1) THE BRICOLLAGE APPROACH to sound production, that is the use of any object as sound source for the music;

Ricardo Arias performaing on the Balloon Kit

2) COLLABORATION: working in an electronic music studio assembling sounds on tape soon struck me as a lonely and hollow activity no matter how satisfying the results. Teaming up with like-minded musicians proved far more rewarding;

3) REAL TIME: Fixing sounds on tape never quite convinced me by itself. It seemed to cripple them, to cut short their potentiality. They had to be produced and handled *in situ*;

4) IMPROVISATION emerged naturally as the most suitable practice to deal with this state of affairs (though not necessarily the only one).

To round up this definition attempt I will quote a paragraph from Eddie Prevost's book *No Sound Is Innocent*, in which he outlines a way of music making closely akin to that which I have been trying to explain:

> Finding a new sound, mastering its production, and then projecting it: this is the work of a meta-musician. It is commitment to this investigative ethos which sets him apart from the technocratic ideal: he is not concerned with the production of perfect examples of a given form. Certainty comes only in the constant search for a sound to meet the need of the meta-musical context. Sensing, evaluating and acting, in creative dialogue, are the medium of the meta-musician.
>
> (Eddie Prévost, *No Sound is Innocent*, p.3.)

SUPERFICIAL MUSIC

In 1986 Luis Boyra, Roberto García, and I came together under the name "Sol Sonoro." The trio functioned as a workshop to improvise and develop collective and individual ideas. We worked in the beginning with an ever-shifting arsenal of found objects (they were lost almost as soon as we had found them), usually small and amplified with contact and air microphones, devising simple, ephemeral proto-instruments. During the first

years we always used amplified mirrors and other flat, solid surfaces as idiophones, rubbing, scratching, hitting them, etc, with hands and multifarious objects. When I started using balloons, around 1987, it was then partly just a matter of transferring some of these techniques to a round, soft and elastic surface (at the same time Luis and Roberto also diverted into soft territories, of a more intangible nature, designing computer programs for use in live performance).

PLAYING TECHNIQUES

(Música Global & The Balloon Kit)

I will go now into the various techniques of sound production, as I've used them through time, presenting, when suited, some notation examples.[1] This survey is by no means comprehensive and the references to other musicians' works are limited to a handful of scores and reports that I have been able to come across.

During a first phase I exploited balloons mostly in their capacities as "elastic aerophones," and to a much lesser extent as membranophones. These balloon investigations were carried out in a strictly asystematic way, dictated by the "need of the meta-musical context." They didn't formalize until January, 1992 when the idea of making a balloon piece popped up. I entitled it "Música Global" (a pun on the word *globo*, which in Spanish — in Spain — refers to both balloon and globe) and proceeded to catalogue the means of sound production. I thought the best way to communicate these techniques to other people would be to make instruction diagrams of the actions. I numbered each diagram and considered that to be a sufficiently explicit, yet conveniently loose score to bring about an interesting performance for a group of balloonists. The piece centers exclusively on the use of hand-held balloons, played by standing performers. It prescribes the use of balloons of various shapes and sizes, from spherical to oblong and from "piccolo" to "contrabass" (fig. 1). A director prompts the performers by displaying the numbers corresponding to each action (I've done this by means of paper cards and by projecting slides with numbers on a screen in front of the ensemble). "Música Global" has proven to be specially interesting for use in workshops with children, who are more familiar with the instrument and relate to it more naturally than adults. One of the first sounds one gets from a balloon is that produced when it is inflated (fig. 2, upper drawing). One can use also the sound of the air released from it as it deflates (fig. 2, lower drawing). However, the main sound featured in "Música Global" is the "double-reed effect," produced by pinching two sides of the neck of an inflated balloon with the thumb and index fingers of both hands and stretching them apart (fig. 3). When the air is released, the opening acts "as a bilabial — a sort of oboe reed in reverse."[2] Pressing the body of the deflating balloon against the balloonist's body, combined with constant adjustments in the tightness of pinching, a pretty fine control over the release of pneumatic energy can be attained, affecting both pitch and loudness, and the balloon can be sounded until almost completely empty (fig. 4). While emitting sound in this manner one can introduce the mouth of the balloon into one's own and use one's mouth cavity (fig. 5, drawing on left) as a filtering chamber by changing its shape — a-e-i-o-u and/or any other permutation.[3] While in this position, as with most wind instruments, one can also make use of lips, tongue and teeth for articulation purposes (interrupting completely or partially the air flow by biting the balloon's neck or by obstructing its mouth with the tongue, lips, etc.) (fig. 5, drawing on right). One can drown the screeching balloon in a bowl of water, producing a very interesting timbral modulation as the sound travels from the air into the water (fig. 6). In experiments with combinations of different states of these variables the balloon will utter a wide range of sounds, from precisely tuned notes, through multiphonics, to chaotic, grainy, vaguely pitched noises. Inflated balloons can also be used as percussion instruments and sounded by friction, with wet fingers and hands, or with various objects. In "Música Global" only the hands are used (fig. 7).

I've explored percussion and particularly friction in more depth with the Balloon Kit (fig. 8), finding many different sounds depending on which part of the hand is used — i. e., carefully scratching the balloon with the fingernails, caressing it or tapping it with the fingertips, the palm, etc. Amongst extraneous objects I've used to rub, scratch and beat I can mention plastic cocktail mixers, pieces of styrofoam and cleaning sponges — rubbing the balloon with a wet sponge, apart from cleaning it, elicits a weary, smooth, clearly pitched and loud buzz, sustainable for as long as the hygienic action lasts. One can make rattles with inflated balloons too, by placing one or more pebbles — such as dried peas — inside them before inflation. Shaking these latex maracas one gets rich drumming sounds, enhanced, when using many pebbles, by the sounds produced by the peas colliding among themselves (fig. 9, left). Furthermore, if one spins the balloon, producing a centrifugal force which in turn causes the pebbles to *orbit* sticking to the inner surface of the bladder, a continuous rumble is created, its pitch depending on the size of the balloon, the material of the pebbles and the speed of the motion (fig. 9, right). One can also rub two inflated and moistened balloons against each other. This produces an extremely subtle and soft texture, a complex hiss, which is better heard if amplified with air microphones (fig. 10). A quite drastic one-time-only sound, that of popping the balloon — usually with a pin or other pointed piece of hard material (fig. 11 above) ... smokers may use a burning cigarette (fig. 11 below)[4] — leads us to a new area of activity: recycling. There are some interesting ways of using the pieces of latex left over by a balloon blast. The first one is to make small balloonets, "an inch or less

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1 Notation of balloon sounds usually consists of one or a combination of the following: 1) a textual description of the action; 2) a diagram of the action, and 3) a prescription of the way the action(s) are to unfold over time. (This, in turn, is usually also a combination of text and graphic in a more or less conventional musical notation — see Mauricio Kagel's *ACUSTICA* and David Bedford's *BALLOONMUSIC I*)

2 See Bart Hopkin, "Balloons and Bladders", *Experimental Musical Instruments*, Vol. V #4, pages 1 and 16-20.

3 Here are two examples of texts used by composers in their scores describing this manner of sound production: "blow up the balloon with breaths of various lengths, till extraordinarily taut / stretch the neck of the balloon so much with both hands that when air is let out, a double-reed-like sound results. The opening of the balloon is to be taken deep into the mouth. Change vowel combinations slowly and continually, also interrupting them — through the consonants D, G, K, P, T" (Mauricio Kagel, *ACUSTICA*, p. 38); "Let air out of your balloon slowly, holding the neck to produce a continuous squealing sound . . . stretch the neck of the balloon to make the note get higher [...] Begin with the neck stretched well apart and gradually relax it. This will make the note get higher" (David Bedford, *BALLOONMUSIC I*).

4 Some composers and performers, such as David Bedford and Judy Dunaway, in view of the obliterating effect of blowing up their instruments, use this resource to give an end to their pieces.

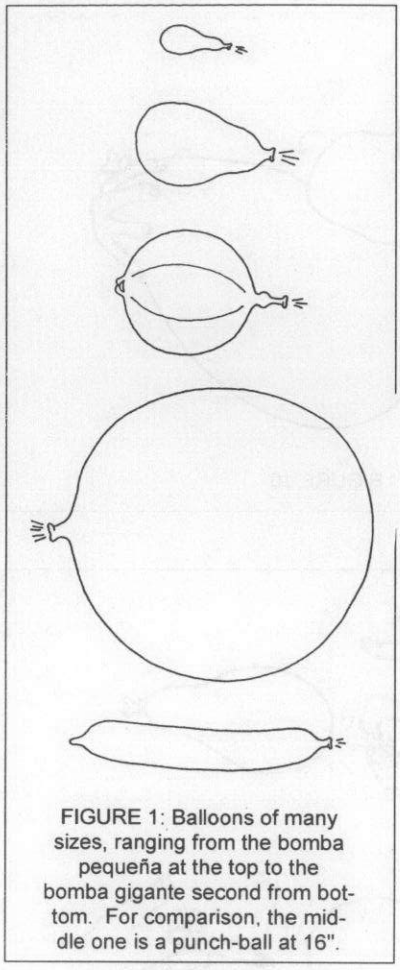

FIGURE 1: Balloons of many sizes, ranging from the bomba pequeña at the top to the bomba gigante second from bottom. For comparison, the middle one is a punch-ball at 16".

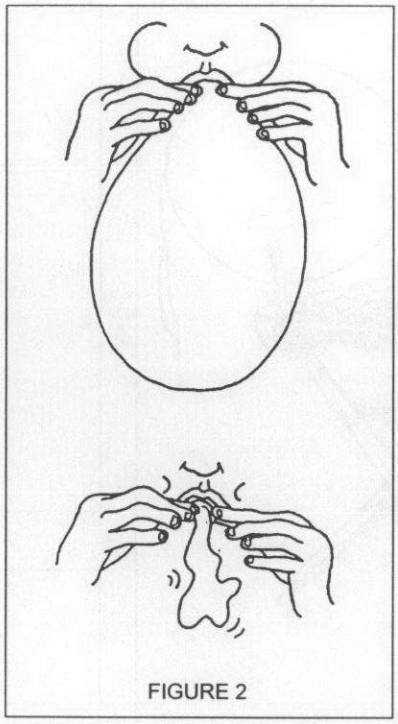

FIGURE 2

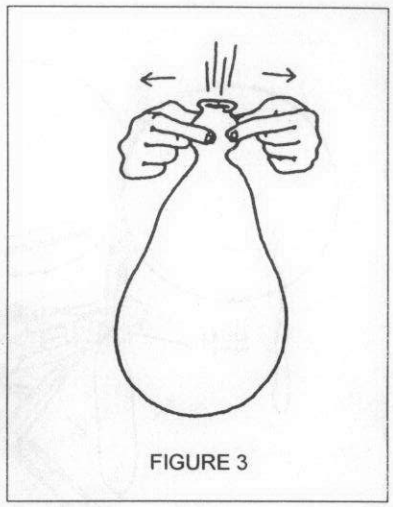

FIGURE 3

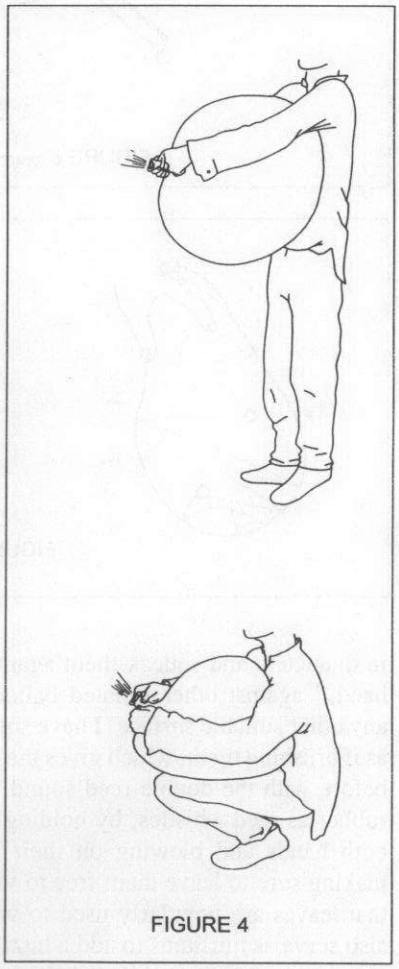

FIGURE 4

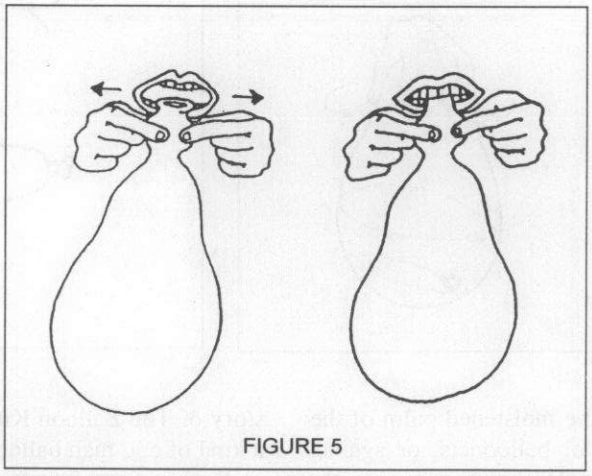

FIGURE 5

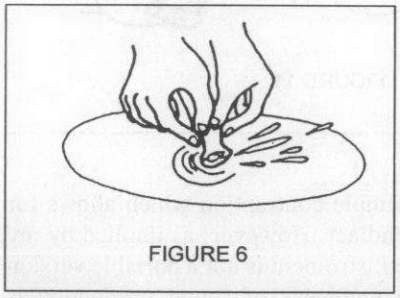

FIGURE 6

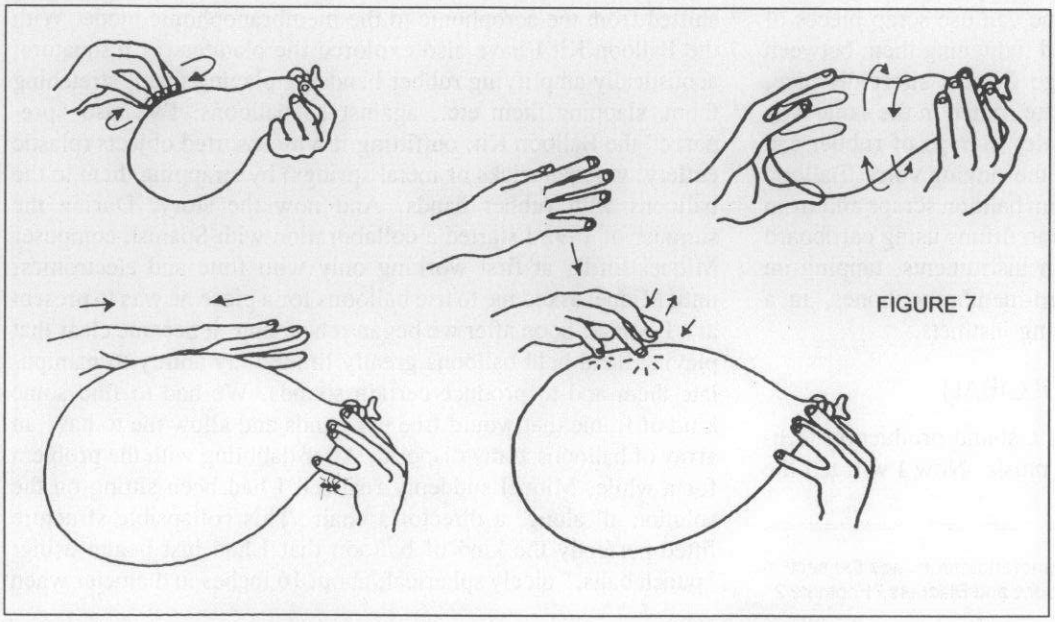

FIGURE 7

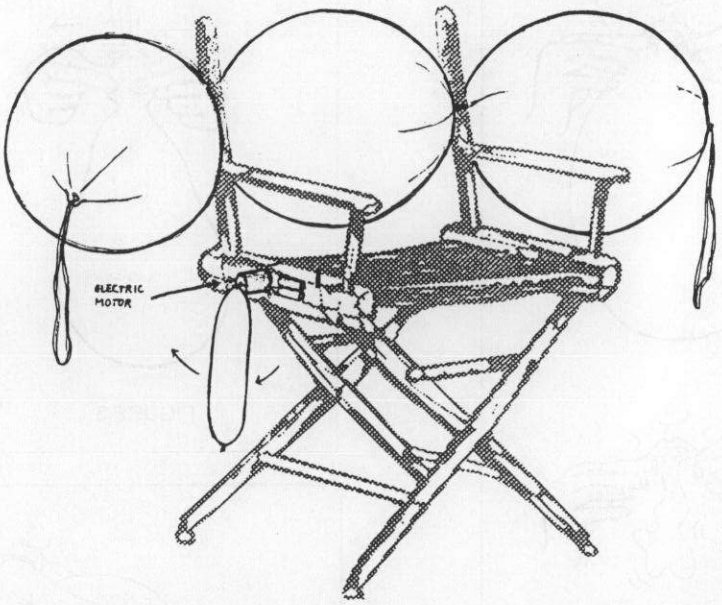

FIGURE 8 (graphic by Ricardo Arias)

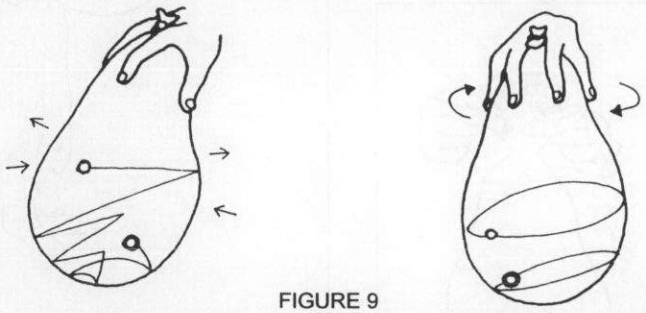

FIGURE 9

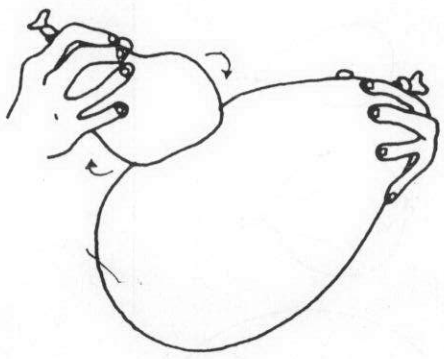

FIGURE 10

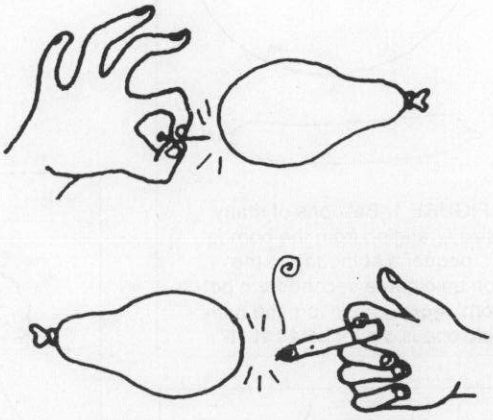

FIGURE 11

in diameter, and squeak them against the moistened palm of the hand," against other inflated balloons or balloonets, or against any other suitable surface. I have squeaked them against my teeth, as if brushing them, which gives the possibility of filtering as done before with the double-reed sound. One can use scrap pieces of rubber as reed whistles, by holding and tightening them between both hands and blowing on their edge from a short distance, making sure to leave them free to vibrate (much in the same way that leaves are popularly used to whistle). Scraps of rubber can also serve as mirlitons to add a buzz to the singing voice. Balloon membranophones can be made both from balloon scraps and from uninflated balloons. I have made balloon drums using cardboard tubes. I use them as finger percussion instruments, tapping on them and plucking them, and as aero-membranophones, in a natural extrapolation of my flute blowing instincts.[5]

THE BALLOON KIT (BATERÍA GLOBAL)

So far I have mentioned most of the sound production techniques that I've used to make balloon music. Now I will tell the story of The Balloon Kit, a simple contraption which allows for a kind of one-man balloon-band act. However, as implied by my earlier mention of the Kit, the instrument is not a portable version of "Música Global," as the emphasis of sound production is shifted from the aerophonic to the membranophonic mode. With the Balloon Kit I have also explored the bladders as resonators, acoustically amplifying rubber bands by playing them, stretching them, slapping them etc., against its balloons. I've also "prepared" the Balloon Kit, outfitting it with assorted objects (plastic cutlery, wooden sticks or metal springs) by strapping them to the balloons with rubber bands. And now the story. During the summer of 1992 I started a collaboration with Spanish composer Miquel Jordà, at first working only with flute and electronics, until Miquel asked me to use balloons for a piece he was to present at a Festival. Soon after we began rehearsing, it became clear that playing hand-held balloons greatly limited my ability to manipulate them and to produce certain sounds. We had to find some kind of frame that would free my hands and allow me to have an array of balloons at my disposal. After dabbling with the problem for a while, Miquel suddenly realized I had been sitting on the solution all along: a director's chair. This collapsible structure fitted perfectly the kind of balloon that I had just begun using: "punch balls," nicely spherical, about 16 inches in diameter when

5. For an in-depth examination of balloon membranophones see the section Bart Hopkin devotes to them in his article "Balloons and Bladders," Footnote 2.

fully blown and made of very sturdy, thick latex. It also provided a good support for further attachments. One could have clusters of smaller balloons waiting to be blown up, stretch remnants of balloon rubber between the legs as rough strings, etc. I attached a variable-speed electric motor on one side of the chair and used it to propel a balloon to act as a cyclic beater onto the corresponding punch ball. This enabled me to have some automation, a crass, funky, not so regular rhythm, on top of which I could engage in other sound activities. The Balloon Kit was at first the object of many experiments and I even gave up the chair in favor of a specially built aluminum frame. This, however, didn't last too long, as the frame proved inferior to the chair. So during a time I relied on chairs available at concert sites. Then I abandoned it almost altogether until 1996 when I blew it up once more and played it in a lot of different settings. In this, its latest incarnation, the Balloon Kit is used in its simplest form: a chair and three punch balls. As such it has forced me to refine the playing techniques and to come up with a good microphonic set up for optimum loudspeaker projection.

END GAME

In any case, the playing of such an unstable, contingent, sound source, no mater how hard one strives to fix it, remains largely a matter of trial and error (trial and discovery?). And for me this is the exiting part of this balloon game.

Born in Bogota, Colombia, in 1965, Ricardo Arias studied composition, electroacoustic music techniques and flute in Barcelona, Spain during the mid '80s. He has made several tape pieces and has collaborated with many musicians on improvisation projects. His music has been heard, live or otherwise, in Spain, France, Holland, Germany, Colombia and Uruguay. He currently lives in the United States and can be reached at 39-70 52nd St. Apt. 2, Woodside, NY 11377, USA; email mandrade@ic.sunysb.edu .

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THE WORLD OF BALLOON MUSIC

BALLOON REPERTORY

1962. George Macunias (LIT) Solo for Balloons with J.P. Wilhe, Jan 3 1962.

1963. Robert Watts (USA) *Piece with Balloons.* A Fluxus performance piece; all I know about it is that it was first performed at the Festum Fluxorum in Düsseldorf, Germany, on February 2, 1963. See photograph on page 79 of Emmett William's book *My Life in Flux — and Vice Versa.*

1967. Allan Bryant (USA) *X-es Sex*, for four performers, boots, balloons, rubber band instruments, taped sounds, contact microphones and audio-controlled lights. Ref: "Repertoire Internationale des Musiques Electroacoustiques / International Electronic Music Catalogue," compiled by Hugh Davies, *Electronic Music Review* Nos. 2/3, April/July 1967, p. 109

1969-70. Mauricio Kagel (ARG/GER): *ACUSTICA für experimentelle Klanggerzeuger und Lautsprecher.* Köln: Universal Edition

1970. Anthony Braxton (USA): *Balloon Piece.* I know nothing about this piece other than its mention on a list of Braxton's compositions published in *Source* magazine #10, 1971

1974. Tom Johnson (USA): *Imaginary Music,* Nos. 4, 51, 79, 103 and 104. (My own imaginary interpretation. These whimsical graphic scores, though indeterminate with respect to instrumentation, look balloonish enough for inclusion in this list.) New York: Two-Eighteen Press

1975. David Bedford (ENG.): *BALLOONMUSIC 1 for any number of players from 2 to 1,000 each with 2 Balloons, a pin and their voices.* London: Universal Edition, 1975

1978. John Zorn (USA): *The Book of Heads*, 35 etudes for solo guitar, making use of "Toy balloons, talking dolls, mbira keys, wet finger whoops, whisks, knocks, multiple harmonics... Not confirmed. Tzadik Records catalogue

1994. Rodolfo Acosta (COL.) "Carqueris", for a mixed group of conventional and not so conventional instruments. Private edition by the composer.

OTHER REPORTED INSTANCES OF BALLOONING IN THE MUSICAL REALM

In this article I have referred to several balloon-music compositions and performances, and there have been many more such individual works at various times and places. In addition to these, I'd like to mention a few artists who have specialized in balloon sound on an on-going basis:

Spanish composer Antonio Palacios and his group Plásticos Palacios, have made extensive use of latex balloons as musical instruments alongside a wide variety of plastic and rubber objects.

Guitarist/improviser/composer Judy Dunaway has gained a reputation as an accomplished balloonist in the New York City new music scene.

The California musician Prent Rodgers, from the 1970s through the early 1980s, developed a variety of innovative ballooning techniques, devised several balloon instruments and used them frequently in performance. San Francisco builders Tom Nunn and Chris Brown, among others, have continued to make use of Prent Rodgers' ideas.

François and Bernard Baschet, in France, made extensive use of balloons particularly in their early work in the 1950s and 60s. (Prent Rodgers, mentioned above, credits the Baschets for many of his ideas.) Much of their work incorporated balloons as sound radiators (the latex surface acting as a soundboard) and vibrational insulators (balloons used in mountings for other sounding components, allowing them to vibrate extraordinarily freely without shaking other nearby components).

SCOT JENERIK'S FIRE MUSIC

By Mike Hovancsek

Scot Jenerik performs highly physical, pyrotechnic sound pieces with an assortment of self-designed instruments. In his "Demons Eating of My Flesh and Drinking of My Blood" he beats furiously on flaming sheets of steel that shoot flames up to fifteen feet in the air with each blow. Gloves and knee pads he wears in this performance contain contact microphones that amplify the connection between performer and instrument. In addition, photo cells trigger various sound sources according to the height of the flames that leap into the air when the steel is struck.

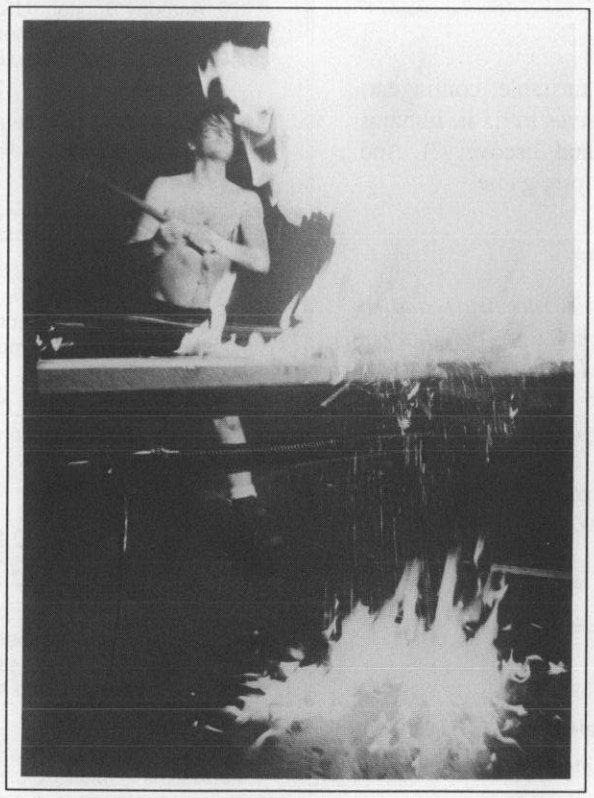
Other sound-producing instruments include an eight-foot-long 2x4 strung with springs and piano wire. Once it is set on fire, the 2x4 is struck with hands, triggered metal drum sticks, and a four-foot pipe.

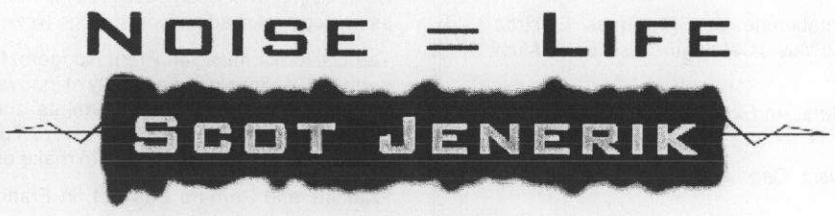
Also incorporated into the performance is a flame thrower harp that is strung with springs. The harp shoots flames approximately six feet into the air when it is activated.

The sheets of metal, the 2x4, and the flame thrower harp are all amplified. They also produce sound when they are struck with the contact mic gloves and knee pads.

Although I haven't seen Scot perform in person, I have seen a video tape of "Demons Eating of My Flesh and Drinking of My Blood." The tape shows excerpts from a clamorous, energetic performance as Scot pounds on his flaming instruments until he reaches a point of complete exhaustion.

I interviewed Scot recently to get more specific, technical information on his work for *EMI* readers:





Mike Hovancsek: Tell me about the photo cell triggers you use on your instruments.

Scot Jenerik: The photo triggers were developed by Pat Asbill from a design I gave him. I wanted something that would switch between two sound sources, or from silence to sound, or from sound to silence, triggered by light. What he built was a box with two inputs and one output, with a photocell trigger that acts as the switcher. In asking him to describe the specifics he wrote:

The photocell, photoresistor or phototransistor drives the base circuit of a transistor which turns the transistor off and on with changes in the presence and absence of light on the photo device. In turn, the transistor activates an spdt relay which switches a common line between the two lines.

Use of the relay makes the signal path reversible: If terminal *a* is the common, and *b* and *c* are the two terminals that *a* can be switched to, then *a* can be the input that switches between outputs *b* and *c* with changes in light, or *b* and *c* can take turns feeding output *a*.

MH: Where are the triggers located on the instruments?

SJ: The triggers are installed in different places depending on the instrument. On the flame thrower it is up toward the tip, so that each blast registers. On Dante [a sheet metal percussion instrument], it was set in a tube, with the angle of focus about five feet above the instrument. That way only the larger plumes of fire would trigger the photocell.

I also use a lot of contact mic triggers. For example: my knee pads have contact mics attached to them. The signals from the pads are sent to a mic preamp and then to the key insert of an electronic noise gate (the gate will open only when a signal is sent from the knee pads). A constant sound of a low-end explosion (from a cassette tape) is fed to the audio-in of the gate, and the output is sent to the mixing board. The gate is set so that it will only open, allowing the explosive sound to be sent to the board, when I strike my knee on the floor, or hit the knee pad against something else, like my fist. I use triggers on the 2x4 and pipe in exactly the same way. It's kind of a low budget sampler.

The faustschlags (the gloves with triggers) initially started out

with the same type of set-up but I found that my drumming was so fast, the gate would never have time to close, so I was essentially just playing the tape. I eventually hooked them up to a D-4 drum unit, so that each strike was the sound of a kick drum. That way as I was drumming fast on the steel — which was a much higher pitch — the triggers would help give a specific strike and clarity to the patterns I was playing.

I usually have to preamp the contact mics that act as triggers, since the signal is often too faint to register in the processing gear. I'll eventually get a sampler so I can more precisely manipulate the triggered sound.

MH: What do you use to produce a workable flame?

SJ: I only use isoproponol, except for the flame thrower which uses propane. The main reason for this is that I can get it (isoproponol) anywhere. I usually buy it in five gallon containers, but on tour I can stop in at any drug store and pick it up. The flame burns cool, in a relative way, as it gets very hot next to ten feet of flames. It also burns off the surface so there is less worry of it soaking into a wood floor and it won't leave a mark. When it splashes on me I get less of a burn than with something like lighter fluid. I would like to experiment with other substances, especially gels, but I haven't had a safe environment in which to work.

I recommend that anyone interested in doing fire work should:

Over-engineer everything. Test burn rates and heights (in Dante one quart equals 7½ minutes and can go as high as fifteen feet).

Always have two fire extinguishers on hand with people who know how to use them, and most of all,

Refuse to perform in a space that you don't think is safe. A small screw up in a flame show can cause major problems and is potentially lethal to the performer and audience. Be a professional.

MH: Where do you get your materials?

SJ: I'm a firm believer in using standard everyday products for construction of the instruments. All of the instruments I've built have been scrap metal or parts from hardware stores. Not only is it cheaper than some finely crafted musical doodad, but I tend to get rather brutal while playing and I couldn't afford to keep replacing expensive parts. Also, replacement parts are at any hardware store. It forces you to rethink instrument building and causes greater experimentation. Bolts and eyebolts with lock washers make great tuning pegs; you just have to tap a hole and keep a wrench handy.

I buy piano wire by the pound, anything from 12 to 23 gauge sounds great (25 gauge is O.K. but it's tough to get good tension since it is so heavy). The lower gauge number, the smaller the diameter of the wire and the higher the pitch. I get piano wire from piano supply distributors.

The processing gear, on the other hand, is treated very carefully. I got tired of using cheap, poor sounding equipment so I will only buy pro gear these days, unless there is a stomp box with a specific sound I'm looking for. Using cheap gear for a specific sound is OK, but having all of your sound inhibited by cheap gear is unacceptable. I also really like what can be done with technology in messing with a sound wave; I just need to have the sound originate from an unusual, physical analog source.

Faustschlags (gloves with triggers)

MH: Tell me about the flame thrower harp.

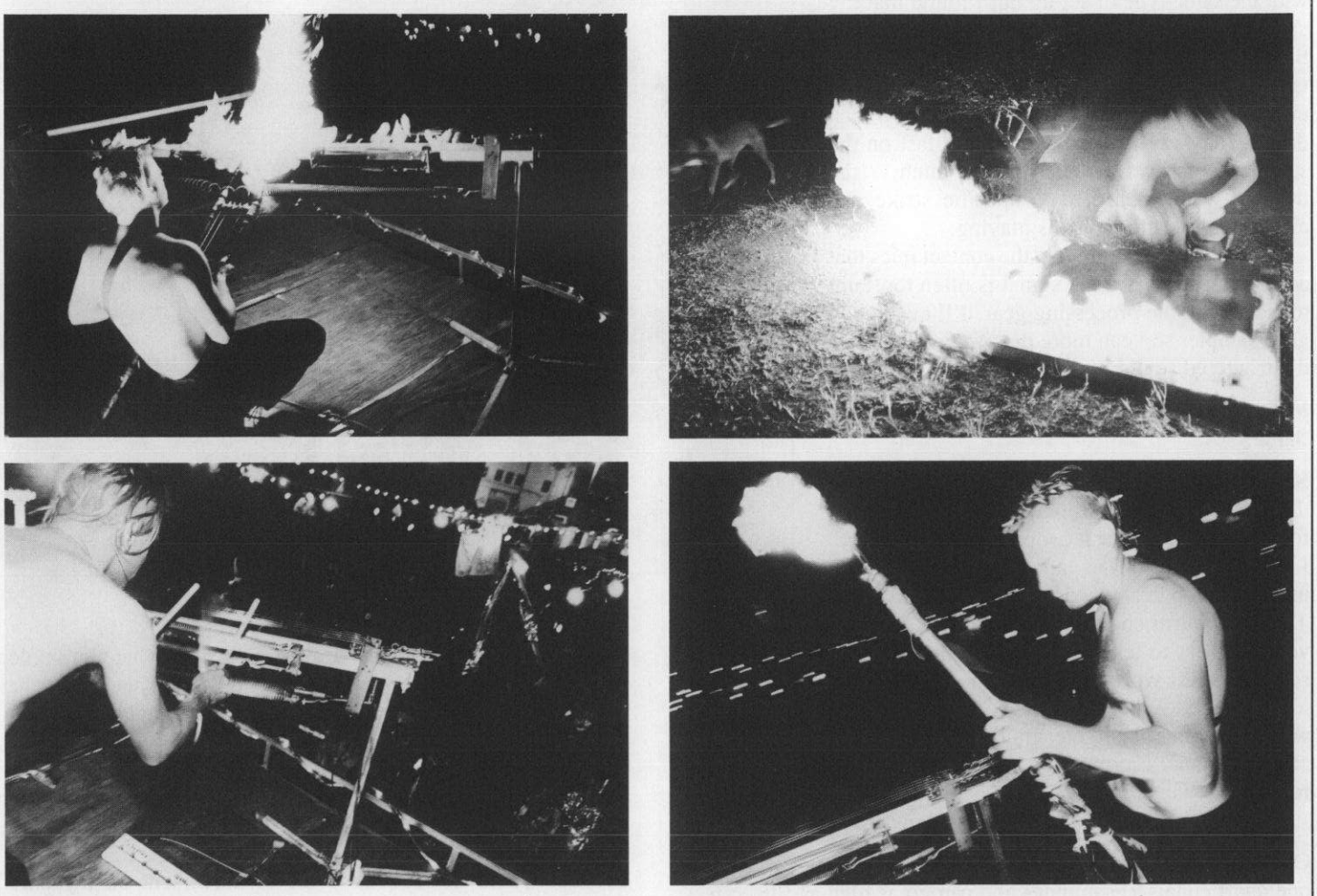
SJ: The flame thrower harp started off as a flame thrower kalimba (thumb harp). Since my shows are so energetic, I wanted to start the performance with an instrument that would have a large impact but that would not require a lot of movement on my part. I eventually — over about three different variations — ended up with the one in the pictures. I'm sure it will evolve more since I'm not completely satisfied with the sound.

It, like all of my strung instruments, is amplified with a contact mic siliconed to a piece of sheet metal that folds over the bridge. That way the string or spring is resting directly on the sheet metal which carries more vibration than the bridge itself. The contact mics on the flame thrower don't burn. Actually, that is one of the more solid instruments I've built. It rarely has problems. It did take a while to get the propane feed working so that I could use the instrument outdoors and not have it blow out.

On Dante I did have a problem of constantly burning off contact mics. What finally worked was to wrap the mic in auto muffler tape, the stuff you would use to repair a hole in your exhaust pipe. This kept the solder points on the contact mic from melting and kept the ceramic on the contact mic from becoming brittle and flaking off.

The flame thrower consists of a propane feed with quick release compression fittings and hose. The framework is standard threaded pipe with gas thread putty on each fitting. (Check any compression fittings by putting liquid dish soap around the joint and blowing compressed air into the unit. If a bubble forms, you have a leak.)

There are two ball valves, one for the feed and one for the main blast. The jet tips are from the small canister propane torches (the kind you use in soldering pipes) with the reducers taken out. The five springs are stretched over a bridge with two contact mics. A third contact mic picks up up the sound of the flame as well as being a nice drumable source. There is also a standard microphone



Scott Jenerik in performance with flame instruments

for the occasional scream.

The flame thrower is played by plucking, strumming, and drumming. Every part of the instrument is played. The sound of the flame is as yet unamplified but it still makes a nice acoustic roar. Most of the time I use short blasts of flame as punctuation within the rhythm. I can't leave the valve open for too long because the pressure drops and I end up with a flaccid flame.

MH: What is the next step in the development of your sounds?

SJ: I tend to think of each instrument as a piece. It gets developed until I feel that there is no need to push it any farther. Then, I move on to the next one. The 2x4 is currently being redeveloped into an all-aluminum instrument that will have a more precise sound and will have flames throughout the performance.

All in all, I feel like I'm just getting started. We are currently buying a warehouse space, which stimulates the imagination. It has twenty-foot I-beams just waiting to be strung...

For video and CD recordings of Scot Jenerik's work, contact him at: P.O. Box 460951, San Francisco, CA. 94146-0951, or at jenerik@kumr.lns.com

In the June, 1995 issue of *Experimental Musical Instruments* (Volume 10 #4), Cary Clements gave us a fine history of the famous horned fiddle of Augustus Stroh, known as the Stroh Violin. More recently, Cary has given us articles on unusual and obscure patents for musical instrument of the distant and not-so-distant past. In the article that follows here, he revisits both of these topics, with a report on U.S. patents issued for horned violins inspired by the original Stroh design.

HISTORICAL PATENTS FOR HORNED VIOLINS

By Cary Clements

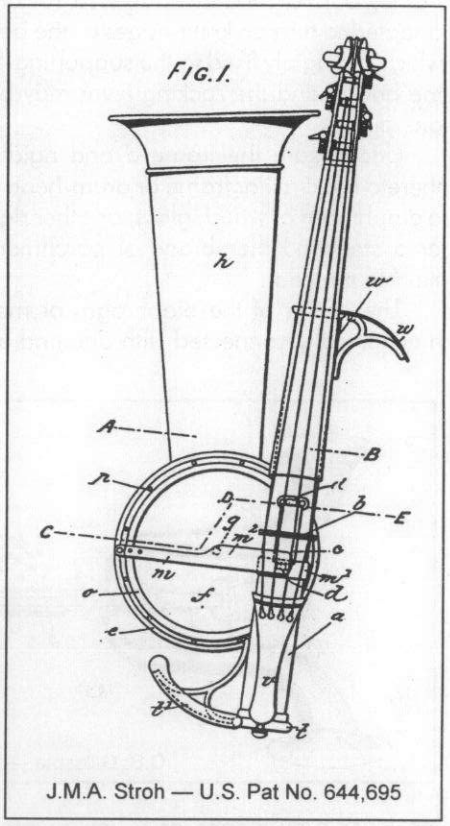
"The right conferred by the patent grant is, in the language of the statute and of the grant itself, 'the right to exclude others from making, using, or selling' the invention. What is granted is not the right to make, use, or sell, but the right to exclude others from making, using, or selling the invention".

— from the pamphlet "General Information Concerning Patents," published by the U.S. Department of Commerce Patent and Trademark Office.

In the following article I will look at fourteen patents issued in the United States between the years 1900 and 1949. The common thread in these patents is that they are all for horned violins.

When Augustus Stroh was issued a patent in 1900 for "a violin which has a diaphragm or membrane and a resonator instead of the ordinary violin-body or sounding-board," it appears that there was already in place a plan to manufacture and distribute the instrument. His design, which has come to be known as the Stroh violin, was built steadily for more than 40 years from that time.

What motivated Stroh to design this instrument? Undoubtedly, he saw the need for a directional, strong-in-the-mid-range, louder-than-usual violin that would solve the problem of recording that most popular of musical instruments using the wax-medium acoustic recording equipment of the day. And solve the problem it did. The Stroh violin was used in the recording studio for more than twenty years, until the advent of electrical sound recording.

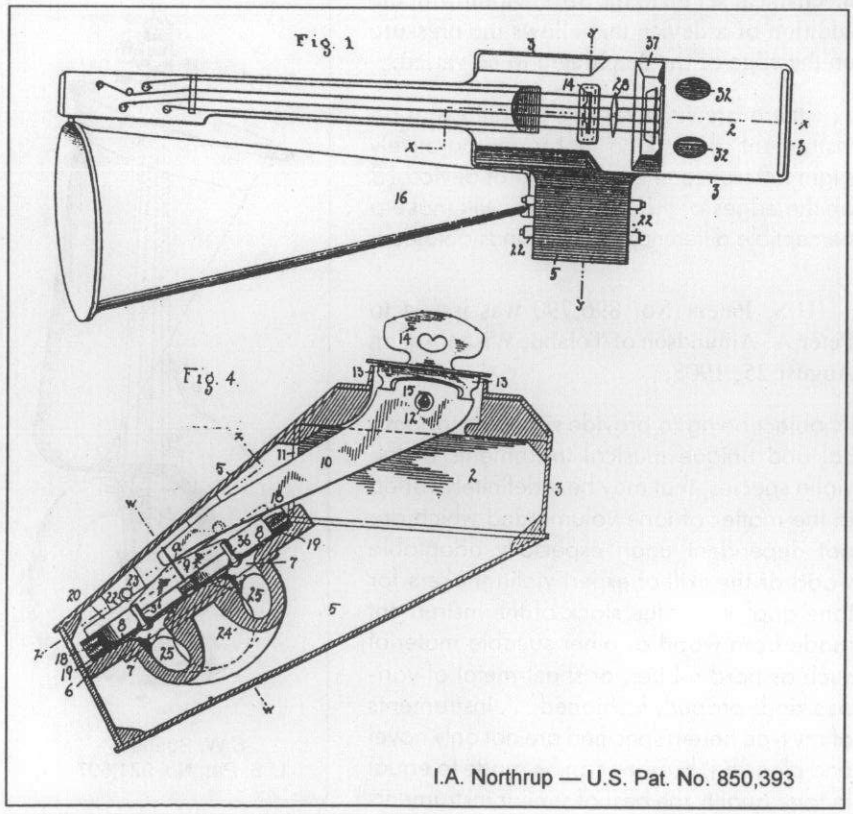


J.M.A. Stroh — U.S. Pat No. 644,695

After the introduction of the Stroh violin, there followed what would appear to be a string of imitators. However, close examination of the patents of some of these inventors, issued in the years up until mid-century, reveal that most were not "imitators" but innovators in their own right.

The commercial success of these instruments was essentially nonexistent. This does not mean that they did not have merit. Some of the designs are very ingenious. This proves the point that I've made in other patent articles in *EMI* — that the success of a patent is due not to the efficiency of the design, but to the marketplace and the needs of the day.

The patents that we'll be looking at in this article are for musical instruments that have the same basic features of the Stroh violin. The Stroh is a violin in which the bridge does not drive a soundboard as with a standard violin, but instead is mechanically connected to a small membrane at the base of a megaphone-style horn. The horn transmits the vibration of the membrane into the surrounding air. To see how



I.A. Northrup — U.S. Pat. No. 850,393

this works in more detail, let's read Mr. Stroh's description from the text of U.S. Patent No. 644,695:

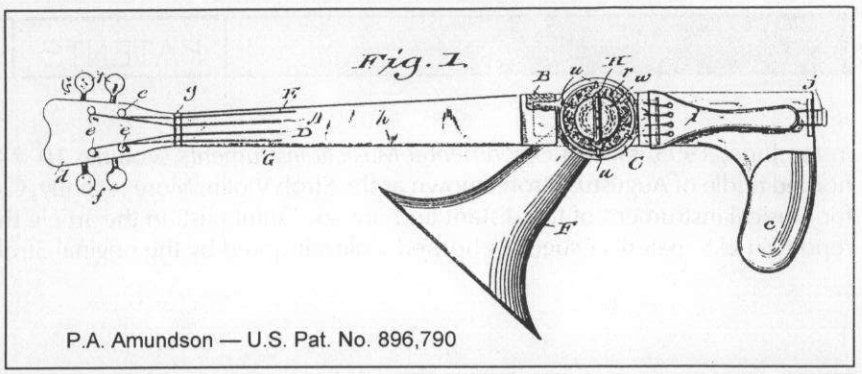
The strings, together with the bridge, finger-board, head, neck, and tailpiece, of the violin are mounted on a suitable tubular body portion. ...The bridge *b* is not directly attached to the said supporting-frame, but rests on a transverse rocking lever *c*, adapted to turn on knife-edges *c'*, the bearings *d* of which are rigidly fixed to the supporting-frame *a*, or the bridge and the rocking lever may be made of one piece.

Underneath the frame *a* and rigidly attached thereto is a circular frame or drum-head containing a diaphragm of wood, glass, or other rigid material or a stretched membrane of parchment or other flexible material.

The center of the diaphragm or membrane is mechanically connected with one end of the rocking lever *c* by means of a link or other suitable transmitting device, so that the vibrations of the violin-strings when bowed will be finally transmitted to the diaphragm *f*. The latter may be open to view on one side, while the other side is enclosed by a cover *e*, having in the center an opening against which is attached a resonator or tube *h* to augment and distribute the waves of air caused by the mechanical vibrations of the diaphragm. The said resonator has preferably the shape of a trumpet, as shown but other suitable forms of resonators may be adopted.

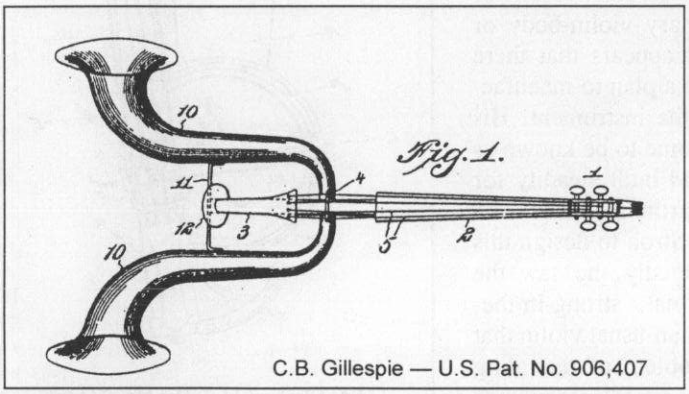
If a bow be drawn across the strings, the vibrations of the latter will cause the bridge, together with the rocking lever, to oscillate on the knife-edges, and the oscillations of the lever will be transmitted through the link to the diaphragm. The top of the bridge is therefore an arc of a circle having its center in the axis of oscillation formed by the knife-edges, and the bridge is either made of one piece with the rocking lever or so connected with the same that all vibrations transverse to the strings will be transmitted to the lever.

With that in mind let's look at some of the inventions that followed Stroh and examine the improvements to his design. I've quoted from the text of the patents as much as possible because often the language is very beautiful, and rather than muddle a description, I'd prefer to let the designer use his own words. Any numerals that appear in the body of the text refer to the accompanying drawing.



P.A. Amundson — U.S. Pat. No. 896,790

U.S. Patent No. 850,393 (drawing on previous page) was issued to Irvin A. Northrup of Medina, Ohio on April 16, 1907.



C.B. Gillespie — U.S. Pat. No. 906,407

. . . the invention consists in a violin provided with an attachment whereby the tone of the instrument is strengthened and mellowed...

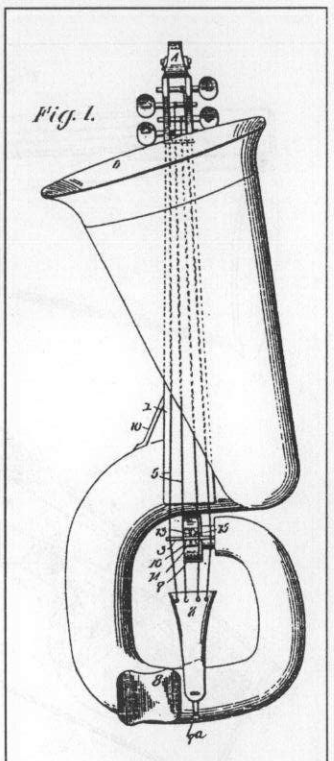
One, two, or more diaphragms 8 may be used; but to obtain a fine tone at least two are required. The shape of said diaphragms is preferably elliptical, as shown; but the shape depends more or less on the material used and its graduation in thickness, and one may be thicker than the other. The variation in thickness or size equalizes the tone produced. When these and other attendant conditions are fulfilled, such as a proper sounding relation to or with the air in the body of the instrument, a very rich, mellow, and pleasing tone is obtained throughout the entire compass of the instrument and in magnified volume as compared with the violin alone.

This instrument has a similar mechanical set up to the Stroh violin with the addition of a device that allows the pressure on the edge of the diaphragm to be varied.

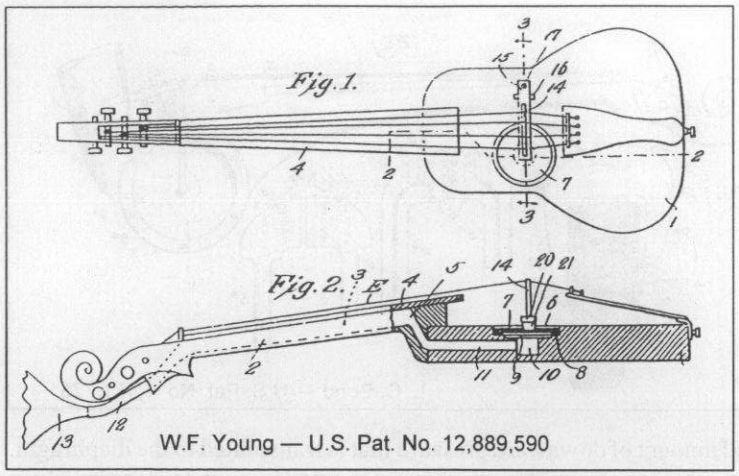
. . . there are such varying conditions in an instrument of this kind that a comparatively slight difference in the pressure of device 18 on the edges of the diaphragms will make a perceptible difference in the sounds obtained.

U.S. Patent No. 896,790 was issued to Peter A. Amundson of Toland, Wisconsin on August 25, 1908,

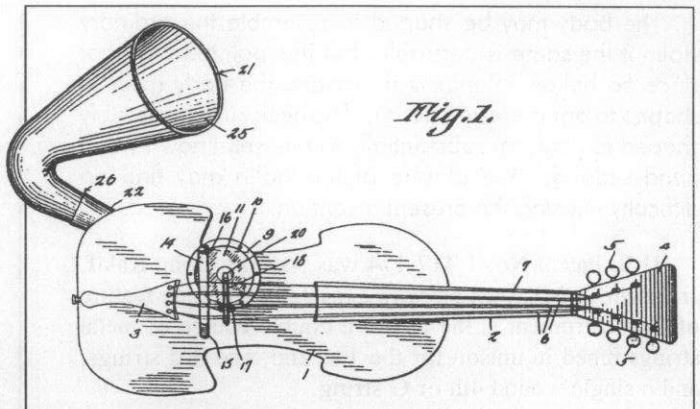
its object being to provide simple, economical and unique musical instruments of the violin species, that may be indefinitely varied in the matter of tone volume and which are not dependent upon especially adaptable wood or the skill of expert violin makers for tone quality . . . the stock of the instrument made from wood or other suitable material such as hard rubber, or sheet-metal of various kinds properly fashioned . . . instruments of my type herein specified are not only novel and pleasing, but they can be made to equal in tone quality the best of similar instruments



S.W. Buerklin
U.S. Pat. No. 921,507



W.F. Young — U.S. Pat. No. 12,889,590



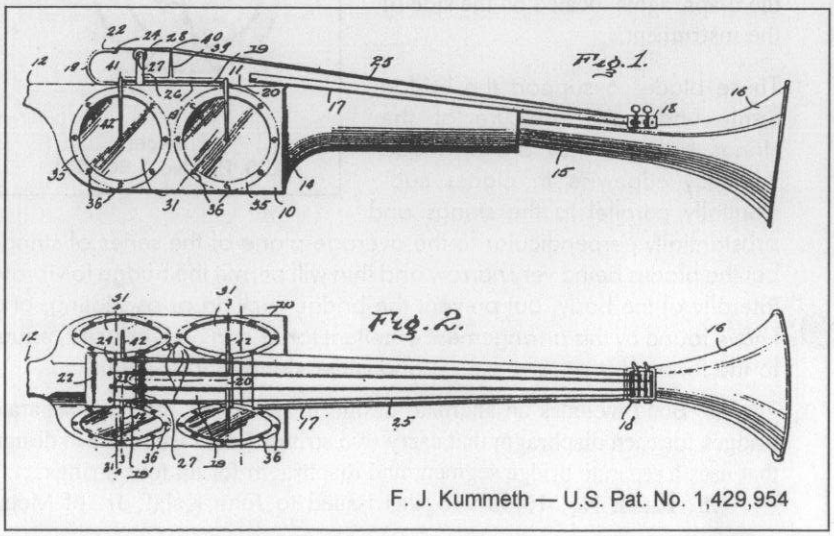
J. Kalaf, Jr. — U.S. Pat. No. 1,417,174

of the ordinary construction and to excel the same in tone volume.

The idea behind this invention is that the body can be made of sheet metal or hard rubber and mass produced in molds or on a punch press. I don't know if an instrument based on this patent was ever manufactured.

U.S. Patent No. 906,407 was issued to Charles Benton Gillespie of Buford, North Dakota on December 8, 1908. This is a very wild-looking instrument. A very cool and wild-looking instrument. Think of it as the long-horn violin. If you look closely at the drawing, item no. 12 is the chin rest. That's where you put your chin. So you're playing this thing and you have two very large horns curling around both sides of your head. That must be disconcerting. Not for the claustrophobic. The improvement here is the use of two diaphragms and horns instead of one.

The invention has for its object to increase the volume and to improve the quality of the sound; and with these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims . . . When the strings are vibrated, the vibrations are transmitted through the transmission bar or bars 14 or 21, as the case may be, to the diaphragms 8, and the sound waves are discharged through the horns with very pleasing and satisfactory results.



F. J. Kummeth — U.S. Pat. No. 1,429,954

U.S. Patent no. 921,507 was issued to Samuel Buerklin of Prague, Oklahoma on May 11, 1909 for what could be called the Tuba violin. Yow, look at the size of that horn! Actually the body and the horn are one piece.

The resonant body, before mentioned, is substantially circular in cross section, and gradually increases in size from one end to the other, the larger end being provided with a bell 6, while the smaller end is provided with a sound box 7, upon which is mounted the bridge. The resonant body extends from the sound box outwardly thence rearwardly substantially parallel to the tail piece, then transversely, and substantially parallel with the tail piece to a point beyond the bridge, where the said body crosses below the strings and the finger board and is then bent upwardly and gradually merged into the bell which is arranged above the finger board as clearly shown in Fig. 1.

One question I would raise about this design is that there doesn't seem to be much room for bowing the strings. But again remember that this is a patent drawing and not a blueprint that the instrument is being made from. It would be an easy matter to modify the design slightly to allow for more room for bowing. My next question would be whether or not Mr. Buerklin actually made any of these violins. It looks like it would be fun to play!

U.S. Patent No. 12,889,590 was issued to Walter F. Young of Merrill, Wisconsin on December 31, 1918. What is different about this instrument is that the sound travels from the diaphragm to a channel in the solid body, through a "longitudinal groove" in the neck and then out of a horn that's mounted on the back side of the pegbox.

The primary object of the invention is to provide a stringed instrument similar to the ordinary violin, that can be cheaply and inexpensively manufactured to produce an instrument of desirable resonant qualities and increased carrying power only found in an expensively constructed violin.

Another object of the invention is to produce an instrument of this character that will entirely obviate the necessity of having a hollow body, such as is commonly employed in the ordinary violin.

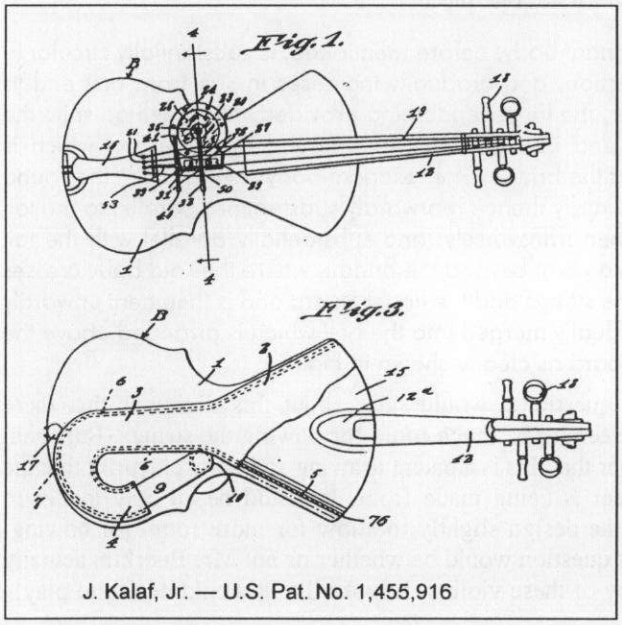
Another object of the invention is to provide a musical instrument of this character that will transmit the tone produced from the strings through a sound conveying duct toward the end of the instrument neck where the sound may be emitted through a horn.

The body may be shaped to resemble the ordinary violin if the same is desirable, but it is pointed out, that since no hollow interior is necessary, the body may be shaped to any preferred design. The neck . . . is preferably shaped to conform substantially to the well-known violin hand slide, so that players of the violin may find no difficulty in using the present invention.

U.S. Patent No. 1,417,174 was issued to John Kalaf, Jr. of Meta, Missouri on May 23, 1922. A unique feature of this instrument is the use of a double course of metal strings tuned in unison for the 1st, 2nd, and 3rd strings, and a single wound 4th or G string.

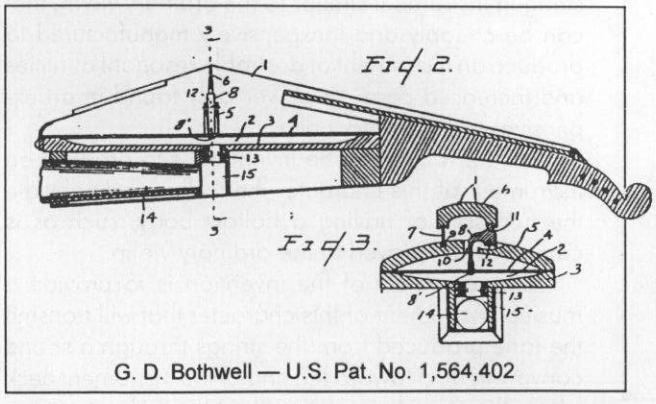
The double metal strings 6, clearly increase the volume of sound and the loudness of the tone.

Another feature of this instrument is the use of a "main bridge serving to take up much of the strain produced by the tension in the strings" and an "auxiliary bridge *18* ... supported upon a foot *19* having a depending end *20* resting on the diaphragm *11*."

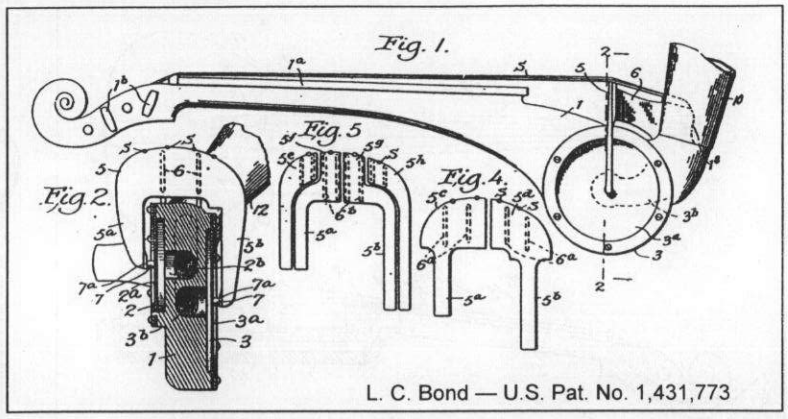


J. Kalaf, Jr. — U.S. Pat. No. 1,455,916

The vibrating lengths of the strings are determined by the nut at one end, and the auxiliary bridge at the other. One foot of the auxiliary bridge sits on the diaphragm and causes it to vibrate when the strings are bowed. The strings pass over the auxiliary bridge at a slight angle and exert a small amount of downward pressure that is transmitted to the diaphragm. Too much pressure on the diaphragm would cause it to depress like a banjo head that's not tight enough.



G. D. Bothwell — U.S. Pat. No. 1,564,402



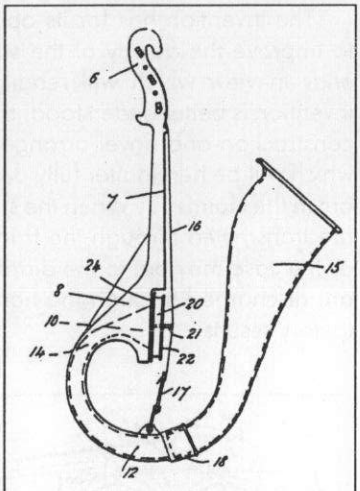
L. C. Bond — U.S. Pat. No. 1,431,773

U.S. Patent No. 1,429,954 was issued to Frank J. Kummeth of Heron Lake, Minnesota on September 26, 1922. Like Mr. Young's violin mentioned above, it has the horn emerging from the end of the neck. A unique feature is the use of a separate "vibrator bar" bridge and diaphragm for each string.

Mr. Kummeth describes his design as "combining the essential characteristics of a violin and a graphophone or what may be termed a violaphone." He further states: "It is another object of the invention to produce a stringed instrument having a tone resembling that of a brass instrument the cost of which would be much greater than the instrument of the present invention." You have to wonder how close this instrument came to actually sounding like a brass instrument.

U.S. Patent No. 1,431,773 was issued to Loren C. Bond of Washington D.C. on October 10, 1922. In Mr. Bond's design "the diaphragm is positively operated with and by the bridge without any rocking of the bridge or any rubbing or sliding movements at the point of connection between the diaphragm and bridge."

This is accomplished by attaching the bridge to the body using "laterally resilient blades." The bridge, which is suspended from the rear by the above-mentioned blades, has two long legs that attach to the center of the diaphragms located on the side of the instrument.


E. Paget
U.S. Pat. No. 1,600,061

These blades 6 support the bridge firmly under the pressure of the strings because they are arranged vertically edgewise in planes substantially parallel to the strings and substantially perpendicular to the average plane of the series of strings but the blades being very narrow and thin will permit the bridge to vibrate laterally of the body, but prevent the bridge rocking or oscillating, and I have found by this arrangement excellent tones can be produced, equal to the tones of expensive violins and other stringed instruments.

Mr. Bond includes an alternate design in his patent that uses separate bridges for each diaphragm that carry two strings each. There's also design that uses a separate bridge segment and diaphragm for all four strings.

U.S. Patent No. 1,455,916 was issued to John Kalaf, Jr. of Meta,

Missouri on May 22, 1923. This is the same John Kalaf mentioned above who was issued that patent almost exactly one year earlier.

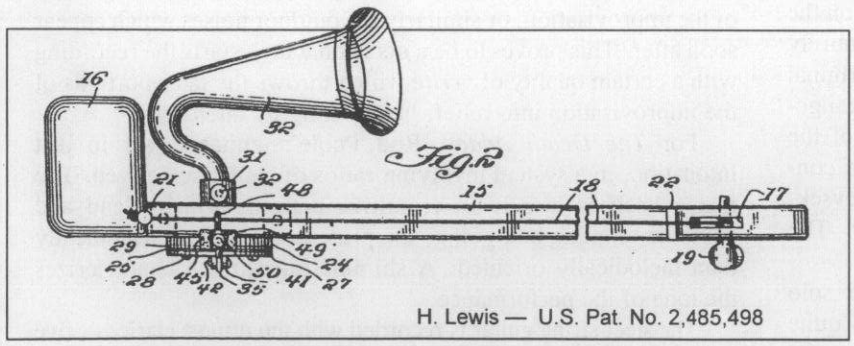
The design for this instrument is basically the same as the earlier one except that "the conduit is housed completely beneath the belly *1*, and, consequently, there are no laterally projecting horns or other sound amplifiers which are extended beyond the body. The instrument, therefore, is compact in form."

There is also no mention in this patent of double course strings. Perhaps in the intervening year Mr. Kalaf was told by his fiddle-playing friends that double strings on a violin are just too hard to play, especially when trying to bow more than one course at a time.

U.S. Patents No. 1,564,402 and No. 1,665,402 were issued to Glenn D. Bothwell of Springport, Michigan on December 8, 1925 and April 10, 1928 respectively. Entitled "Bridge for Diaphragm Violins" and "Horn Resonator Violin," both applications were filed on February 26, 1923, and yet were issued more than two years apart.

Mr. Bothwell's design consists of a body and neck, with a horn that comes out of the bottom of the instrument. The unique feature of this violin is the way that the bridge connects to the diaphragm.

The string-supporting bridge 6 centrally surmounts the bridge 5, the ends of the former respectively engaging a vertical flexible post 7 and a lever 8 mounted upon the latter. Said post is rigidly anchored at the lower end in a groove 9 in the bridge 5, and the bridge 6 is formed in its lower edge with a V-shaped notch engaging said post. The lever 8 passes freely through a slot 10 in the bridge 5 and has its lower end rigidly secured to the diaphragm 4, preferably at the center of the latter, by a screw 8'. The upper end of said lever is pointed as indicated at 11 and seats in a V-shaped notch in the corresponding end of the bridge 6. Below the point 11, and within the slot 10, the lever 8 is pivoted upon a pin 12 mounted transversely in the bridge 5. The lever 8 is laterally bent, just above the pivot pin 12, to establish the desired off-set relation of the point 11 and pin 12 with relation to the central point of the diaphragm 4 . . . By virtue of this off-set relation, vibratory pivotal movement of the lever upon said pin is applied to the diaphragm . . .

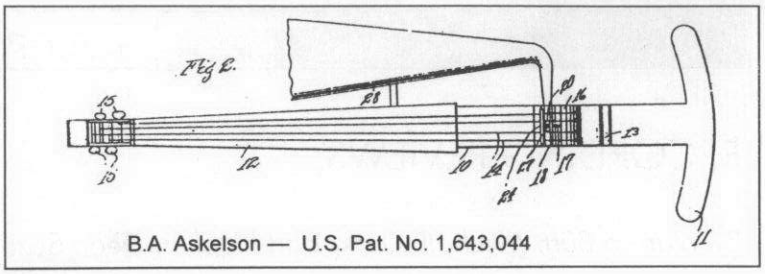


H. Lewis — U.S. Pat. No. 2,485,498

U.S. Patent No. 1,600,061 was issued to Earl Paget of Peru, Kansas on September 14, 1926. One of the features of this violin is that

The bell and the larger part of the horn are preferably formed of trumpet brass, and are provided with a slip joint 18 for convenience in carrying the instrument.

The quality of tone is similar to that of a violin, but is very clear and penetrating. The quality of tone can be varied by changing the material of the diaphragms, and metallic diaphragms can



B.A. Askelson — U.S. Pat. No. 1,643,044

be used to advantage.

U.S. Patent No. 1,643,044 was issued to Benjamin A. Akelson of Mazenod, Saskatchewan, Canada on September 20, 1927. This is basically a slight variation of the Augustus Stroh violin with the addition of one feature:

Another object is to provide an attachment arranged to contact with the strings, slightly in advance of the bridge of the instrument, for the purpose of forcing all of the strings to vibrate, when one string is vibrated by a bow, to render the rocking action of the bridge more effective and certain.

U.S. Patent No. 2,485,498 was issued to Harry Lewis of Gainesville, Texas on October 18, 1949. This is one of the last horned violin patents issued in the United States, coming almost 50 years after Stroh received his.

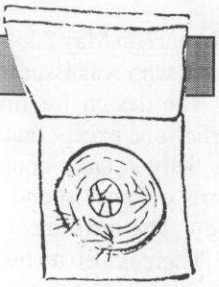
Probably the most amazing thing about this design is that it offers very little that is different from the Stroh violin. It features a rocking bridge, a diaphragm and a horn and claims to be "of simple construction, inexpensive to manufacture and efficient in operation."

The patents that we've just looked at should in no way be considered the extent to which the Stroh violin was copied or improved. They simply represent most of the patents issued in the United States for violins with horns. I haven't included patents from other countries for the simple reason that I don't have access to them.

There were other horned violins manufactured in Europe during the time of the Stroh violin (circa 1900-circa 1942), the most notable of these being the Tiebel violin which is often attributed to the Stroviol Company of London. The Tiebel violin is similar to the Stroh violin with a few minor design changes. Look for more on the Tiebel and other violins, including the horned violins currently made in Burma, in a future issue of *EMI*.

As a musical instrument maker and amateur historian, I can't stress enough what a valuable resourse the patent library is. This article is my take on a huge pile of patents culled from the microfilm of the patent library in Sunnyvale, California. Many *musical instrument experimenters* from generations past are represented in the five million or so U.S. Patents issued so far, not to mention those in the patents of other countries. Forgotten geniuses from long ago wait to be "discovered" by those bold enough to seek out the microfilmed archives of the U.S. Department of Commerce Patent and Trademark Office.

Cary Clements lives in San Francisco where he repairs guitars, builds electric violins, and writes the ocassional article for EMI.



RECORDING REVIEWS

By Warren Burt, Mitchell Clark, Bart Hopkin, Dean Suzuki, and René van Peer

MARGARET LENG TAN: **THE ART OF THE TOY PIANO**

Point Records 456 345-2 (CD)

Margaret Leng Tan's approach to the piano is a vast and inclusive one: she explores the instrument in its widest sense. Her interest is in a fundamental *piano-ness*, so that for all her diverse approaches and uses of technology that expand performance contexts, she is loathe to replace the piano with any kind of electronic keyboard. Margaret Leng Tan expands the piano's horizon, as many have said, but to put it another way, she expands the piano *horizontally* and does not replace it with technology *vertically*. As her uses of technology are to enhance, not to replace, she does not relinquish the physicality and physical involvement of playing the instrument. She relishes the *play* of playing the instrument, and her approach is indeed playful and intuitive, so that all her various activities relating to the piano are quite ingenuous. She is one definition of a total performer.

Margaret Leng Tan's explorations include those into the "image," both physical and conceptual, of the piano. This has led her, in her playful way, quite naturally to the toy piano. As a performer who has focused on the works of John Cage, part of her repertoire has of course included Cage's groundbreaking (and breathtaking) *Suite for Toy Piano*, of 1948. Her embrace of that beautiful piece let the cat out of the bag, so to speak, for the toy piano. She has gone on to champion the instrument, performing what little repertoire there was for toy piano before she came along, as well as inviting and performing new works. She has also found that there is a healthy number of existing piano works which will lend themselves happily to adaptation to the toy piano.

Margaret Leng Tan's recent recording of the Cage *Suite for Toy Piano* for New Albion Records (on *Daughters of the Lonesome Isle*, NA070) is one of a few recordings of that piece on the market, but her new release, *The Art of the Toy Piano*, is entirely unique. The album contains a dozen items, consisting of original pieces (most of them written for Margaret Leng Tan) and arrangements (made by herself or by the composers). The list of the various contributing composers reads like a who's who of contemporary music: Philip Glass, Julia Wolfe, Guy Klucevsek, Stephen Montague, and Toby Twining, to name a few. The program is a solid and varied collection of works.

The range of combinations of instruments — all for solo performer and all with the toy piano at the center — is quite remarkable. There are pieces for toy piano alone (Montague's rousing tarantella *Mirabella*, which opens the album, and Jed Distler's *Three Landscapes for Peter Wyer*), two toy pianos played simultaneously (Glass' *Modern Love Waltz*), and piano played simultaneously with toy piano (Twining's *Satie Blues* and *Nightmare Rag*). In addition, there are a number of pieces for toy piano with other (usually toy) instruments and soundmakers, ranging from David Lang's *Miracle Ear* (toy piano and 3 metal cans) and Wolfe's *East Broadway* (toy piano and toy boombox — a combination which seems to connect an older urban subsoundscape, with small bells being a part of one's aural experience, with a newer one, of percussive electronics) to Raphael Mostel's *Star-Spangled Etude #3* (a brief and charming re-vitalization of the national anthem for toy piano, toy siren, police whistle and cap guns) and Klucevsek's *Sweet Chinoiserie* (toy piano, toy accordion, melodica, toy drums and rattles, glasses, soya sauce dishes and cat food cans). In each of these Margaret Leng Tan is kept quite busy — especially, for example, in Twining's *Nightmare Rag*, when she is required in the right hand to move back and forth, note-to-note, between piano and toy piano while the left hand pumps out a barrel-house piano bass.

Among the older works arranged here for toy piano are the familiar opening movement of Beethoven's "Moonligh"" sonata (so we finally get to hear what Schroeder, the performance's dedicatee, was practicing all those years), the third *Gymnopedie* of Erik Satie (set by Margaret Leng Tan for toy piano and piano), and John Lennon/Paul McCartney's *Eleanor Rigby* (in an arrangement for toy piano by Toby Twining). The sound of the toy piano — pungent and sweet at the same time — fits the poignancy of the latter two tunes with remarkable effectiveness.

One listens to the music on this album and finds oneself asking: where has this beautiful instrument been hiding?

— MC

ROD POOLE: **THE DEATH ADDER**

CD from W.I.N. Records WIN021. Available from W.I.N. Records, P.O. Box 26811, Los Angeles, CA 90026

The Death Adder is a solo improvisation by Rod Poole on one acoustic steel-string guitar, recorded in a single continuous take over 48 minutes long. No attempt is made in the final edit, as one can hear, to remove movement noises that occur at the beginning of the improvisation, or similarly the outdoor noises which appear soon after. This proves to be a decision which starts the recording with a certain quality of *verité* which throws the later portions of the improvisation into relief, heightening its intensity.

For *The Death Adder*, Rod Poole's guitar is set in just intonation, in a system involving ratios of eleven and seven. The music itself is largely in repetitive patterns which blend and combine, coming and going, the piece being more harmonically than melodically oriented. A shimmering surface characterizes the tone of the performance.

The steel-string guitar is recorded with the utmost clarity — five microphones are mentioned in the credits. This clarity of the recording of *The Death Adder* captures the great timbral variety of the pitched sounds which go into Poole's performance. The guitar at times sounds like a wire-strung harp, at times like harmonics on a Chinese *qin* zither, and at times like a prepared piano.

— MC

BRADFORD REED: **LIVE! AT HOME**

On CD from Bradford Reed, 230 Third Street, Brooklyn, NY 11215

Bradford Reed plays the pencilina, an electric double-necked

zither with bells attached. He designed and built this instrument. He uses it on this, his first, CD to accompany his voice in songs that I am inclined to describe as big city country music, with a touch of stargazing. There is an optimistic, the-devil-may-care attitude in this music that is prepossessing. Reed strums the strings, hits them with a rod, bows them — all in the best of spirits, or so it seems. Apparently precision is not the ultimate aim. But then one may ask oneself whether music must aspire to that to be recognized as music. My guess is that Bradford Reed has no desire to be academic about his exploits (he did appear in a Jay Leno show); if that is so, he is without any doubt successful.

One really deviant track is *Hotel Organ*. To be honest, I don't know whether it's customary to have organs in American hotels. Not in the rooms, anyway. Perhaps in the lounges, where lonesome guests can get drunk to squeaky tremolos emanated by a seriously outdated wheezer. This track conjures up this image, and makes you want to sing songs of hearts breaking apart.

Actually it is towards the end of this CD (and I am listening to the final track now) that Reed wanders off the path of ditties into a field where he can pluck and hit away, and have the sticks perform rolls, and seduce the strings into overtones. Then, after several minutes of total silence, you are transported to a place where frogs call out in tones and rhythms similar to what Reed plucks from his pencilina.

— RvP

ASMUS TIETCHENS: **DAS VIEH UND SEIN VATER**

On CD from Realization Recordings, 9452 Telephone Rd. #116, Ventura, CA 93004

This is a CD with music that the German composer of electro-acoustic music Asmus Tietchens contributed to compilation albums from the early 1980s. He seems to be something of a celebrity in industrial music circles; was involved with Brian Eno who released some collaboration albums with the German composing duo Cluster on Tietchens' record label Sky in the 1970s. Listening to *Das Vieh und sein Vater* these connections make sense. The music is dispassionate, betrays a focus on the aesthetic qualities of sound, can be somewhat indeterminate and often proceeds at a slow pace. Many pieces consist at least in part of sustained evocative chords and ditto melodic lines, although unexpected shifts do occur. Tietchens makes frequent use of heavily manipulated acoustic sound sources. On *Tina, ich liebe sie!* (Tina, I love you!) what sounds like a woman panting, transforms into short rhythmic notes from a saxophone. It is possible that far more elements in the music on this CD were constructed in similar manner.

Apparently Tietchens didn't think it necessary to give any information as to the source of the sounds and the ways in which he processed them, or the ideas behind his work. This entire lack of clarification leaves me with mixed feelings. One can argue that the music should speak for itself, that trying to unravel what it's composed of would distract from or devalue the experience of listening. Withholding information can be based on a presupposition that the audience will not be curious about methods and motivations. But then, understanding what is going on can add to the pleasure of listening, lending it extra depth.

As far as I am concerned, a number of tracks do hold their own ground; others sound as if Tietchens has been doodling with studio equipment. Since these tracks were all culled from compilation albums, they must have made different sense in the original context than they do on this CD. Despite the obvious differences between the various tracks (they span a period of fourteen years) there is an underlying coherence. Whatever Tietchens may have been doing in his studio over the years, these activities are consistent in focus. More's the pity that this isn't at least touched on in the liner notes.

—RvP

JEAN TINGUELY: **JEAN TINGUELY**

10" Lp on Manhood, via Chiaia 14, Naples, Italy; available from Anomalous Records, 1402 E. Pike St., Seattle, WA 98122-4148, email: anomaly@wolfenet.com. Also available from Swill Radio, P.O. Box 9401, Amherst, MA 01059-940

Jean Tinguely was a Swiss sculptor and descendant of the Dadaists who made kinetic sculptures, virtual machines which existed for their own sake. Many of Tinguely's machines had no function, though at least one of them made automatic, abstract paintings. His most provocative machines self-destructed, including the large *Homage to New York*, a virtual "Machine Happening" created for the Museum of Modern Art in 1960. As you might imagine, most of Tinguely's kinetic sculptures were, at the same time, de facto sound sculptures with a significant sonic component. This limited-edition record features the sounds of five different creations by Tinguely, including *Bascule VII*, a work from 1969 made of wooden wheels, rubber belts, and electric motor on a metal base; *Hegel* (1988), a mixed-media assemblage; show window displays from Basel, Switzerland; *Méta-Malevich "Point rouge"* (1954) comprised of a wooden panel with round and rectangular metal objects, wooden pulleys, rubber belt, metal fixtures and an electric motor; and *Spirale éclatée* (1957), made from metal objects, wooden pulleys, rubber belt, metal fixtures, and electric motor on a wooden panel. While most of the sounds are percussive, with clanging metal, odd tickings, abrasive scraping, rattling, irregular drum-like sounds, and the like, there are some more "musical" elements, including reed and flute-like tones from *Bascule VII*.

The back of the record jacket features an old, grainy photograph of one of Tinguely's sculptures in action, a very large contraption, perhaps ten feet tall, shooting flames, showering sparks, and billowing smoke before a gathering of onlookers. Both visually and sonically, Tinguely has taken more than a bit of advice offered in Russolo's *The Art of Noise*. Buy this quickly if you are interested, as it is a very limited released.

— DS

UAKTI: **21**

Na Zona Franca de Manaus/Videolar Multimidia Ltda., Av. Solimoes 505A, Distrito Industrial CGC: 22.797.09/0001-01, Industria, Brazil; Uakti Oficina Instrumental, ph/fax: 31 225 9080

Perhaps the most commercially successful sound sculpture group in the world, the Brazilian ensemble Uakti offers up a release which is, at times, a bit more experimental than their domestic releases on Point Music. As always, Uakti's signature is the marvelous end-struck PVC pipe instruments, similar to those of From Scratch, with their incredibly rich and resonant sound. In addition to the PVC pipe instruments and a few conventional instruments (flute, double bass, trumpet with a terrific sounding wah-wah mute), one finds glass harmonica, or at least some manner of rubbed glass vessel, and a host of new and unusual sounds, including an instrument pictured in the booklet with tuned strings with broad flat tongues of wood (?) which are suspended above the strings and against which the strings buzz to create a sitar-like timbre. (This photograph aside, too few instruments are pictured in the booklet and those present are frequently cropped

in such as way as to make the manner of sound production difficult to discern.) There are also mbira or kalimba-like instruments, end-blown flutes, double reeds, mallet percussion, including some made of glass, berimbau-like struck strings, and a plethora of invented, indigenous and traditional percussion instruments of all varieties. While the bulk of the music is more or less tuneful, frequently characterized by quasi-minimalist ostinatos, harmonic structures and musical procedures, including improvisation, derived from the Brazilian jazz and bossa nova traditions, there are a few pieces which are more freely improvisation and abstract. Indeed, Cageian chance operations in the guise of a graphic score with geometric figures was used in the realization of the music. As always, Uakti's recording features splendid production values, capturing a full, sonorous, and at times lush sound, full of detail, subtlety and nuance. While the music is not the most adventurous, it is quite beautiful, certain to delight those who follow the growth of invented instruments, as well as a broader musical following.

— DS

FALLENVLODS: **EACHER HUNDREDS**

Cassette from Fallenvlods/Ernst Records, PO Box 2962, Denton TX 76202 for $4 (US and Canada) or $6 (elsewhere)

EX-PENSIVES: **STATEMENT OF PURPOSE**

Cassette from Chameleon Graphics,15600 NE 8th Street, Suite B1 #457, Bellevue, WA 98008-3917 for $6 (US),$7 (Canada), and 4 pounds (UK)

Two cassettes with a "home-made" feel to them, both of which use unusual instruments or setups in an amplified context. Fallenvlods is the darker of the two. Using electric bass, electric drums, powertools, saw, voice, and lots and lots of feedback, this is an album of atmospheric, gritty textures, often mixed so as to sound like distant environmental sounds. In "In frontal terrain," track four, in fact, I was frequently fooled into thinking I was hearing environmental sounds, until sudden louder and more "musical" gestures — which had many more high harmonics — would appear and refocus my listening so that I could hear that those were not environmental sounds at all, but textures made with instruments. The percussive hammering at the end of this track is like thunder — an appropriately environmental conclusion. Most of the tracks here are not rhythmic — a regular beat appears only occasionally. When it does, as in "God leads police on low speed chase," track seven, it gets faster towards the end, providing a counterpoint for the heavily electronically modified voice reciting throughout it. Much of the text is not understandable, but the final words, "he dreams...he dreams" give a poetic feel to all that has come before. This is also the quality of the muffled, out-of-tune piano solo that emerges from the end of "incent to victory," the last track - a concluding gesture that gives a feeling of nostalgia, or poetry, to what has preceded it. My only criticism of this album is that it doesn't have the best recording quality. At one point I checked my cassette player to make sure it didn't have dirty heads. But lo-fi is often an essential quality of the sound of projects such as this, so I'll be happy to accept it as it is.

Statement of Purpose, by the Ex-Pensives, is a much happier album. The members of the Ex-Pensives have constructed several instruments which feature inharmonic plucked string sounds, such as the Spidey Jangler, the ISD — Industrial Strength Dulcimer, and the Elation Instiller. They have also made an instructional video, "Design and Construction of Electromagnetic Pickups for Musical Instruments," which is available for $15 from the same address. Mostly, this is a high spirited album of grungy-sounding rock numbers, with the inharmonic content and unconventional tuning of the homemade string instruments making a refreshing and happy contrast to the distorted guitar riffs that underlie them. A number of the tracks feature texts of various sorts, including the hilarious "Traffik Reading," which provides instructions as to how to use the directional signals of the cars around you in traffic as aids in making those important decisions in life. This is accompanied by a nice pulsing improvisation on the inharmonic-sounding string instruments. "Horn Dog," track five, is a repetitive piece made of only 3 or 4 repeating riffs. Many other elements come and go over this basic texture, including an obscure female voice speaking in some mysterious foreign tongue. "Murmur of a 21 year old man" is another very funny track. A medical tape, where the speaker has a very stilted British accent, describes various kinds of heart murmurs. This is accompanied by a very off-beat rhythm. Since the medical tape was going to provide us with examples of the murmur, but was cut off by the end of the piece, I wonder if the rhythm they were playing was the murmur in question. For me, the chief attraction of the album is the sound of the inharmonic string instruments, with the humor of the found texts a close second interest. Others may enjoy the good-spirited grunge playing on a number of the tracks, including "Psychotronic Film Soundtrack," which, surprisingly, kept reminding me of The Doors! In either case, *Statement of Purpose* is an attractive debut album.

—WB

OFF RAMP: **OFF CHANCE**

CD from Ramp Records, 3016-25th St., San Francisco, Ca. 94110

CHRIS BROWN: **DUETS**

Chris Brown with Tom Nunn, Tom Djll, Ikue Mori and William Winant. CD ART 1016 from Artifact Records, 1374 Francisco St., Berkeley, Ca, 94702

MIKE HOVANCSEK: **SPHERAL TONE THEORY**

Cassette from Pointless Music, 1889 Algonquin, Kent, OH. 44240

Three very fine albums of improvisation and process-oriented composition here, united by the presence of Tom Nunn and his electro-acoustic percussion boards. What is especially interesting, taking the albums as a group, is how musical context, in this case, who one is playing with, determines the nature of the music.

Off Ramp is a group consisting of Tom Nunn on Electro-acoustic Percussion Boards (EPBs), Doug Carroll on Zeta Electric Cello, and Jim Hearon on Zeta Electric Violin. Each member of the group is also processed through electronic effects, which enable them to greatly extend their timbral range. All three have impressive backgrounds in both improvisation and "art music" composition, and in this album, all three bring what I might describe as a "classical chamber music" sensitivity to their playing. The music here is passionate, and filled with violinistic and cellistic gestures, and these affect how we hear the EPB as well. Tom also shows great sensitivity to context. In "Oyster of Aphrodite," the first track, for example, he uses a volume pedal to bring in a cloud of resonance from the board. The slow attack of the volume pedal relates the board more to a bowed string sound, rather than to the world of percussion. At other times, such as in track 3, "Language of Fish," the percussive nature of the EPB is emphasized, with the strings playing high filigree lines against it. Track 7, "Untitled Afterthoughts," is a texture of processed instrumental sounds that is as thick and rich as soup, spiced up with Jim's occasionally humorous use of his effects. The textural nature of the longer pieces is offset by the four "snippets," percussive tracks of great clarity lasting between 7 and 11 seconds each. These act like the sonic curtains, being

drawn between the acts, and clean our ears for the next larger piece. Normally, I listen to recordings as a self-sufficient activity, but the processing is so extreme on some of these sounds, and the playing is so lively, that I really would like to see this group live, to participate in the physicality of their playing (and also to just see who is doing what!). Those interested in contemporary electro-acoustic improvisation that is really affirmative of its roots in classical chamber music will be delighted by this album.

Equally delightful, but with a totally different feel, is Chris Brown's album *Duets*, on Artifact. Brown plays samplers, electronic effects, computer music systems, and drum machines, and is joined by several other players in duet situations. Three of the tracks are different performances of Chris' situation piece, "Duo," where one performer plays an amplified acoustic instrument, and the other plays a MIDI keyboard that controls electronic effects which process the instrument. Thus, two players cooperate to produce one sound. In these three realizations, the same effects unit and order of effects was used, so that structural continuities could be heard from one performance to the next. The three players here are William Winant, who plays jew's harp and kanjira (a South Indian tambourine), and shows a mastery at extracting a maximum of musical variety out of a minimum in instrumental resources; Tom Nunn on EPB; and Tom Djll on trumpet, who explores the range of breath and wind sounds available with brass tubing. Only occasionally throughout his performance does "normal" brass tone occur. Since Brown's effects tend to take simple acoustic sounds and multiply them into beautifully sculptured noisebands, Djll's approach makes elegant sense here. Drum machine enthusiasts will be pleased by the duet with drum machine virtuoso Ikue Mori, where she and Brown perform a system where two drum machines try to sync up with each other while performing slightly different tempi. The results are a polyrhythmicist's delight. The performances with Tom Nunn are percussive and happily noisy. In "Hot Lunch," track 6, Brown plays samples from his own EPB instruments to accompany Tom's playing, in a form that begins with sustained, closely tuned beating sounds, and progresses through noisebands, and then returns via sustained notes and phrases to a different, but related texture of sustained, throbbing sounds. Likewise, "Urge," the final track, starts off with ethereal slow sounds, and builds to a rich texture of colored noisebands.

Mike Hovancsek's album, *Spheral Tone Theory,* also features rich textures of colored noisebands, here sustained in ways that suggest drones and tonal/overtonal harmonies. The cassette is a series of solos, duets and trios, and one quartet that Hovancsek has participated in. Some of these were mail collaborations (where one partner sends a tape of their contribution to the other), some were studio recordings, and two are live performances. Tom Nunn appears here too, in a really energetic opening track that features Mike on metal objects. The inharmonic spectrum is very much celebrated here. A studio improvisation with Halim El Dabh on voice and percussion is wonderfully wild, with El Dabh's theatrical voice effectively adding to the mix. Voice is also featured in a very short mail collaboration with John M. Bennett, where Mike modifies his voice electronically, placing the modified and unmodified voice into a bed of environmental sounds. "Shimmer," the third track, a mail collaboration with Paul Guergerian, who appears on a number of other tracks, is a study in tremolo for two percussionists who rapidly change timbres, slowing down into sequence of sustained delicate sounds. The most interesting track for me was "The Plastic Museum Fiasco," a live radio performance by John Hajeski (playing his Portable Anarchy, among other things), Barry Chabala (winds, waterphone and sheet metal), and Hovancsek (guitar, bell plates, electronics, and jabberbox) which takes up most of side two. This is a long, and spacious improvisation with a wide range of electronic and percussive timbres. It is nicely multilayered — the playing allows you to hear several layers at a time — and is full of twists and surprises. Readers of *EMI* whose curiosity has been piqued by Mike Hovancsek's ads for "Pointless Music" could profitably start exploring the range of material he has available with this engaging cassette.

— WB

VARIOUS ARTISTS: **WHITE ELEPHANTS & GOLDEN DUCKS: ENCHANTING MUSICAL TREASURES FROM BURMA**

Shanachie 64087 (CD) (website: www.shanachie.com; no postal address given)

In this increasingly cross-fertilized world, Burmese music retains a flavor entirely its own. As evidence of this, here comes *White Elephants and Golden Ducks*, a new CD of music from Burma on the world music Shanachie label.

The package comes through the efforts of Rick Heizman, musician, instrument collector, ethnomusicologist and inveterate traveller based in San Francisco. When travel restrictions in Burma were eased in 1996, Rick, long a lover and student of Burmese music, made sure he found himself there, microphone in hand.

This CD is the first of a planned series of Burmese music CDs. As such it serves as a sampler, with music in an array of styles. The court music that has occasionally leaked out from Burma in the past is not a central focus here. Instead, the approach seems to have been to invite a number of Burmese musicians of the highest caliber to take part in a series of open-ended recording sessions, leaving them free to create whatever sorts of music they felt worth putting on tape. Not all of the resulting music fits neatly into recognized existing styles or genres. Much of it was improvised. All of it has a feeling of freshness, honesty and inspiration.

Several Burmese instruments feature prominently. To name just a few: *Chauk lon bat* and *pat waing* are tuned sets of 10 and 21 tuned drums, respectively. *Pattala* is a 23-key bamboo xylophone. *Maung zaing* is a set of 18 "thin metal, splashy-sounding gongs." *Hne* is a double reed of very nasal tone. We also hear the beautiful Burmese harp *saung gauk*.

In addition to the Burmese instruments, the CD includes music from several western instruments, including piano, mandolin, violin, and slide guitar. One of the many striking things about this collection is the way in which these instruments, known in Burma since colonial times, have been adapted to a Burmese musical sensibility. I could go on about this, but I'll content myself with a single sentence: *you have never heard a piano played like this*.

The sound quality of the recordings is uniformly excellent. The package's liner notes are informative and enjoyable. And the music is best of all, executed with taste, imagination and virtuosity. For anyone not already steeped in the tradition, it will be an ear-opening experience. Sorry to sound gushing about this, but what can I say? This CD is a treasure.

Leading musicians on this CD include U Phone, U Tin Yi, U Ohn Lwin, Ko Thein Htay, Zaw Win Maung, Daw Yi Yi Thant, Ko Myint Sein, Kyaw Kyaw Naing, U Yee Nwee, Ko Ba Htay, and Ko Thein Htay.

— BH

NOTICES

The World Shakuhachi Festival 1998 will take place July 5 – July 10, 1998 at the College of Music, University of Colorado, in Boulder. For information, contact Christopher Yohmei Blasdel, email kokopelli@inJapan.net; or Monty Levenson, Tei Hei Shakuhachi, PO Box 294, Willits CA 95490 USA, email monty@pacific.net; web site http://www.pacific.net/~shakuhachi. [13-2]

FOR SALE: Deagan Organ Chimes in excellent and playable condition. For further details: phone 64-21-480.115; mail PO Box 6070, Brookfield, Tauranga, New Zealand; email greenslade@xtra.co.nz. [13-2]

FOR SALE: Music cassettes of beautiful relaxing New Zealand music, featuring the Deagan Organ Chimes. Innovative and original compositions, 1 hour, vocal and instrumental, 2 titles "Wild Rose" and "Hand Knitted". Written and produced by Gypsy Pennefeather. $10 each plus freight. Phone 64-21-480.115; mail PO Box 6070, Brookfield, Tauranga, New Zealand; email greenslade@xtra.co.nz.

THE SHAPES OF SOUND: MUSICAL INSTRUMENTS AND THE IMAGINATION IN THE MIDWEST is an exhibition of thirty unique musical instruments invented and constructed by fourteen musicians/visual artists from Illinois, Michigan, Minnesota, and Wisconsin. Curated by Hal Rammel, this exhibit includes works by Miekel And, Steve Barsotti, Bill Close, Douglas Ewart, Lyx Ish, Eric Leonardson, David Lundahl, Michael Meadows, Don Meckley, Sam Pappas, Nadi Qamar, Hal Rammel, and Grant Strombeck. The SHAPES OF SOUND takes place at Woodland Pattern Book Center, 730 East Locust, Milwaukee, WI from Saturday, Oct 4, through Wednesday, Dec 31. An opening reception will be held on Sunday, Oct 12 from 1 – 5 p.m. with performances and discussion throughout the afternoon. Call 414/263-5001 for further information. [13-2]

Bears Beat Bowls in the Bathtub, a new book/tape/guide set for children by Kathy Teck, illus. Roy Doty. Narrated by Geoffrey Holder; original music by the Hit-It Band using homemade instruments. $19.95 plus $2.84 shipping (NYS residents add sales tax). Hit-It-Kits, PO Box 139 Gedney Station, White Plains NY 10605.[13-1]

THE TACTUS PRESS. Theremin and historic percussion publications. Write for catalog: The Tactus Press, Dept. EX, PO Box 9704, Austin, TX 78766-9704. (512) 453-7779.[13-1]

Seeking information: If you have information about bamboo saxes, or other sorts of unusual sax-like instruments, builders, history, references, anywhere in the world, please contact Ángel Sampedro del Río, Scalabrini Ortiz 1960, Villa Adelina (1607), Buenos Aires, Argentina, fax (54) 541-794-3880.[13-1]

Bamboo Stamping Drums from the traditional bamboo for this purpose -- Schiziostachyum glaucifolium -- light, straight, thin wall, strong. 3 sizes. Comes in pairs. sml 18-24 in. = $35. med. 2-3 ft = $50. large = $90. Smoked and oiled and bound. Comes with pads and information. Pack and ship air/priority in U.S. = + 15%. Richard Waters, PO Box 1071, Pahoa, HI 96778.[13-1]

EXPERIMENTAL AND ELECTROACOUSTIC RECORDINGS FOR SALE. Many unusual titles, such as Harry Bertoia, etc. LPs a specialty. Send for free listing to: SONIC TIGER MUSIC, PO Box 715, Cambridge, MA 02140 USA; email stmusic@shore.net. [13-1]

Information wanted about the horned violins made in Burma, or if anyone traveling to Burma would like to help with some research for a future *EMI* article, please contact: Cary Clements, 1197 South Van Ness Ave., San Francisco CA 94110; phone (415) 206-9531; e-mail stroviol@earthlink.net. [12-4]

Affordable bamboo and gourd instruments made by us from American bamboo and gourds. Percussion aerophones, panpipes, didjeridu, drums and shekere ... Send for price list: alaBamboo Music, 3447 N. McGehee Rd. #111, Montgomery AL 36111. [12-3]

ORDER THE MUSIC OF THE GRAVIKORD, Bob Grawi's electric double harp based on the African Kora (featured in EMI, April 1988, and Bart Hopkin's new book *Gravikords, Whirlies and Pyrophones*). Cassette tapes $10; CDs $15 (+1.50 s&h) to White Bear Enterprises, PO Box 106, Florida NY 10921; 914/651-2327.[12-3]

Earthshaking Music '97 "World Music Source" is now available (Free!). 400+ cds, books, videos & cassettes. Instruments from everywhere! Submissions of research papers, videos, recordings, instruments, etc. welcomed for inclusion in our catalog. Email to erthshkn@avana.net or call (404)622-0707. [12-3]

Reed Ghazala's **Anti-Theory Workshop** is now offering circuit-bent Incantors, Trigons, Photon Clarinets, Morphiums, Aleatrons, one-of-a-kinds, CDs and collected writings. For Reed's full-color, visually stunning brochure/catalog/fractal artwork depicting 18 instruments, CDs, friendly raccoons and more, please send $1 (or any interesting tidbit of your choice) to: Reed Ghazala c/o **The Anti-Theory Workshop**, Sound Theater, 3325 South Woodmont Ave. Cinti., OH 45213. Present web: http://www.iac.net:80/~cage/reed.html. Coming soon: http://www.anti-theory.com E-mail: qrg@anti-theory.com [12-3]

GRAVIKORDS, WHIRLIES AND PYROPHONES -- book-and-CD boxed set from *Experimental Musical Instruments,* produced in conjunction with the publishing company Ellipsis Arts. A book-and-CD combination devoted to new and unusual musical instruments from some of the world's most interesting and inventive instrument makers. Informative text, wonderful photographs and great recordings. Every track of the CD and page of the book overflow with the ideas and the originality of the featured builders. 37 musical instrument makers appear in the book, with music from 18 of them included in the CD. Price $29.95 for the book and CD (no shipping charges for U.S. air mail or overseas surface rate; add 25% for overseas air; California residents only at 7.25% sales tax), available from EMI at PO Box 784, Nicasio, CA 94946, USA; phone/fax (415) 662-2182; e-mail EMI@windworld.com Visa & Mastercard accepted. [12-3]

Musical Instrument Design: Information for Instrument Making, by Bart Hopkin, editor of *Experimental Musical Instruments,* published by See Sharp Press. *Musical Instrument Design* presents underlying principles for the design and construction of acoustic musical instruments of all sorts, with a practical, hands-on approach. No other book gathers this information under one cover. Just under 200 pages long; large format; fully illustrated. $18.95 plus $2 s&h. (This covers shipping charges for U.S. air mail or overseas surface rate; for overseas air add another 25%. Customers in California add 7.25% sales tax.). Order from *Experimental Musical Instruments*, PO Box 784, Nicasio, CA 94946, USA, phone/fax (415) 662-2182. [11-4]

The EMI Wall Chart is a beautiful 24" x 36" wall poster, with graphic design by Gwendolyn Jones, covered with practical reference information relating to musical instruments and instrument making. Suitable for the workshop or living room. Some of the material on the chart replicates material in the *Musical Instrument Design* book (see previous ad), but since the wall chart format has its own advantages, you might be happy to have both. The price is $12. (No shipping charges for air mail within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order through *Experimental Musical Instruments.* [11-4]

Making Simple Musical Instruments: A Melodious Collection of Strings, Winds, Drums & More — A book by Bart Hopkin, editor of *Experimental Musical Instruments*, published by Lark Books. It is a collection of plans for home-buildable musical instruments, ranging in difficulty from simple to moderate. The book is written for a general, non-specialist audience, and the approach is non-technical. The instruments aren't so very far out: most of them relate to familiar instrument types and are playable as such. Yet even experienced experimenters will find some new ideas here. It's hardbound, with 144 big and very full pages, lots of color, beautiful photos & illustrations; price $24.95 plus $2 s&h. (This covers air mail within the U.S. or overseas surface rate; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order from Experimental Musical Instruments, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182; email EMI@windworld.com. Visa/MC accepted.

Air Columns and Toneholes: Principles of Wind Instrument Design is a spiral-bound booklet containing the four articles on practical wind instrument acoustics by Bart Hopkin that appeared in EMI in 1992 and 1993. The articles have been revised and improved, and there are several additional features included. Published by Tai Hei Shakuhachi; available for $14.00.

(This covers air mail shipping within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax). Order from EMI, Box 784, Nicasio, CA 94946.Visa/MC ok.

DISPLAY ADS IN EMI are more affordable than you might think. $60/half page, $40/quarter page, $25/eighth page. If you have a product or service that you'd like to promote just a bit more conspicuously, call or write for details: EMI PO Box 784, Nicasio, CA 94946; phone/fax 415/662-2182.

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The following is a list of selected articles relating to musical instruments which have appeared recently in other publications.

"Some Observations on Technology and Musical Instruments" by Edmund A. Bowles, in *Newsletter of the American Musical Instruments Society* Volume 26 #2, June 1997 (4023 Lucerne Dr., Huntsville, AL 35802).

An essay on the ways in which technological developments in other fields historically have affected the development of musical instruments.

"C.G. Conn's Wonder Violin — The Best Violin on Earth?" by Margaret Downie Banks, in *America's Shrine to Music Museum Newsletter*, Volume XXIV #4, August 1997 (414 E. Clark, Vermillion, SD 57069-2390).

An account of the commercial rise and fall of a particular violin design marketed by C.G. Conn Company (better known for wind instruments) in the years after the turn of the century, highlighting in hindsight the incongruity between advertising claims and the reality of product quality and sales.

"Learning to Listen: Children's Books that Guide the Way (Part 1)" by Gary Ferrington, in *The New Soundscape Newsletter* Number 5, Aug-Sept. 1997 (WFAE, SFU, School of Communication, Burnaby BC V5A 1S6, Canada).

A short introduction to children's books teaching sound awareness, including a listing of six such books with commentary on each.

"Building a Glass Harp (Musical Glasses)" by Peter Bennet, in *Glass Music World*, Summer/Fall 1997 (2503 Logan Dr., Loveland CO 80538).

The author describes how, through years of searching, he gathered a set of musical glasses that produced the pitches of his desired scale, and then assembled and mounted them to produce the instrument that he plays today.

Drawing by Robin Goodfellow

"Le Tuntui, Tambour de Bois Jivaro" by Pierre Salivas, in *Percussions* No. 51, May-June 1997 (18, rue Théodore-Rousseau, F-77930 Chailly-en-Bierre, France).

An illustrated article on slit drums of Peru, with information on history and social context, construction, and musical style. (In French.)

"Les Phônes," in *Revue & Corrigée* #32, June 1997 (25 rue Docteur Bordier, 38100 Grenoble, France).

An interview with members of the French group of instrument makers and performers, Les Phônes. Included are photos of several of the group's extraordinary and beautiful instruments. (In French.)

"Five Mouthy Instruments" by Wayland Harman, in *The Pluck-n-Post* Vol 1 #3, Summer/Autumn 1997 (PO Box 92, Sumpter, OR 97877).

The author discusses the salient points of five different mouth-resonated instruments: mouthbow, clackamore (an oral percussion instrument invented by the author), Jew's Harp, nose whistle, didjeridu and voice.

"KY '97 Show a Success" by Nita Cates, in *The Gourd* Vol. 27 #3 (PO Box 274, Mt. Giliad, OH 43338-0274).

Included with a brief report on the Kentucky Gourd Show (May, 1997, Taylorsville, OH) are two photos of a "brass band" that appeared there, playing lip-buzzed instruments of gourd.

"*Pleng*: Composing for a Justly Tuned *Gender Barung*" by Bill Alves, in *1/1*, Vol 9 #4, Spring 1997 (535 Stevenson St., San Francisco, CA 94103).

The author discusses how he commissioned a special pair of the Javanese metallophone *gender barung*, with a particular tuning, intended for use in his compositions. The article emphasizes the construction process and the nature of the tuning, as well as his composing with the instrument.

"Guitar String Pioneer" (no author credited) in *The Music Trades*, July 1997 (80 West Street, PO Box 432, Englewood, NJ 07631).

The story of how nylon guitar strings were developed by the late Albert Augustine in response to a wartime shortage of gut for string making, followed by an interview with Rose Augustine, wife of the string maker.

"Precious Woods: How Musi-Kraft Uses Global Lumber Sourcing to Deliver a Unique Line of Replacement Parts" (no author credited), also in *The Music Trades*, July 1997 (address above).

An account of the world-wide searching and detective work of one company in filling requests for unusual and specialized musical instrument woods.

FoMRHI Quarterly #88, July 1997, contains articles on historical instrument names (cittern, gittern and related), string physics, early harpsichords, sound absorption and transmission in woods, and more.

Vierundzwanzigsteljahrsschrift der Internationalen Maultrommelvirtuossengenossenschaft (VIM) #6, 1997 (601 N. White St., Mt. Pleasant, IA 52641-1327) contains a wealth of articles on trump (editor Frederic Crane's preferred term for Jew's harp), including a report on trump festivals past and future, articles on different sorts of trump from Siberia and the Philippines, and an account of trumps appearing in movies.